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ABSTRACT

This report is the sixth in a series of reports designed to summarize the empirical research findings and major theoretical approaches relating to the issues of drug use and abuse. This volume reviews some of the major research studies which explore the nonmedical use of drugs as it relates to all modes of death. Included are studies describing suicide, homicide, morbidity and mortality as these pertain to the drug abuser. The report also describes a number of classification and reporting systems for drug-related death. The summary for each reported study provides the reader with the purpose, methodology, findings and conclusions of that study. (Author/SJL)

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Research Issues 6

DRUGS AND DEATH

NATIONAL INSTITUTE ON DRUG ABUSE

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Cover Illustration

William Blake. The figure of Urizen or the Ancient of Days.
Frontispiece from *Europe*. Illuminated printing.

DRUGS AND DEATH

The Nonmedical Use of Drugs
Related to All Modes of Death

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November 1974

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FOREWORD

The issues of drug use and abuse have generated many volumes of words, all written in an attempt to explain the "problem" and suggest the "solution." Data have been generated by researchers from many disciplines, each looking at a particular aspect of an issue. The present booklet is one of a new series intended to aid researchers who find it difficult to find the time to scan, let alone read all the information which exists and which continues to be published daily in their area of interest. An attempt has been made to focus predominantly on empirical research findings and major theoretical approaches.

Included in volumes 1 through 7 of the series are summaries of the major research findings of the last 15 years, formulated and detailed to provide the reader with the purpose, methodology, findings and conclusions of previous studies done in the topic area. Each topic was chosen because it represented a challenging issue of current interest to the research community. As additional issues are identified, the relevant research will be published as part of this series.

Several of the volumes in the series represent a departure from the above description. These also represent challenging issues, and issues of current interest; they are, however, virtually unexplored areas which have received little attention from the research world. For example, the subjects of drugs and the visual arts, science fiction, and fiction--aspects of contemporary life which impact on all of us--are explored here by writers who have been deeply involved in those fields. Their content is perhaps provocative, and certainly stimulating.

The Research Issues series is a group project of staff members of the National Institute on Drug Abuse, Division of Research, Behavioral and Social Sciences Branch. Special thanks are due to the continued guidance and support of Dr. Louise Richards and Dr. Norman Krasnegor. Selection of articles for inclusion was greatly aided by the suggestions of a peer review group, researchers themselves, each of whom reviewed a topic of particular interest. It is my pleasure to acknowledge their contribution to the project here.

Dan J. Lettieri, Ph. D.
Project Officer
National Institute on Drug Abuse

ACKNOWLEDGMENTS

A bibliographic project such as this necessarily involved a great number of people, all of whom contributed their own particular talent. Many worked on more than one phase of the project. Many more are not named here--their help and advice was instrumental in shaping and defining the series and the individual topics. It is important, however, to distinguish between the members of the peer review group who were instrumental in the initial selection of the articles to be included and abstracted, and the members of the abstracting team who bear sole responsibility for the final format and content of the abstract of each research paper included in this volume.

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PREFACE

An extensive and comprehensive literature search was carried out to identify materials for inclusion in the Research Issues series. Major clearinghouses, data bases, library collections, and previous bibliographies were searched, either through an automated system or manually. Special efforts were made to correspond with organizations, institutions and individuals who might have relevant materials. Current issues of newsletters and journals were scanned throughout the project. A selective list of the sources accessed includes:

National Clearinghouse for Drug Abuse Information (NCDAI)

NCDAI: Report Series, Selected Reference Series

Drug Abuse Current Awareness System (DACAS)

SPEED: The Current Index to Drug Abuse Literature

Grassroots

Addiction Research Foundation, Bibliographies

Drug Dependence

Psychological Abstracts (PASAR)

Sociological Abstracts

Dissertation Abstracts

Index Medicus (MEDLINE)

Addiction: Bioresearch Today

Research in Education (ERIC: RIE)

Public Affairs Information Service (PAIS)

Monthly Catalog of U.S. Government Documents

Music Index

Art Index

Guide to the Performing Arts

Reader's Guide to Periodical Literature

The criteria for selection of documents were drawn up by a consultant group of drug researchers working with the contractor and representatives of the National Institute on Drug Abuse. For inclusion a study had to meet the following general criteria:

(1) empirical research studies with findings pertinent to the particular topic, or major theoretical approaches to the study of that topic

(2) published between January 1958 and January 1974, preferably in the professional literature, with the exception of certain older "classics" which merited inclusion and unpublished dissertations

(3) English language; however, since the focus was on American drug issues, those English language materials which dealt with aspects of drug use encountered largely in other countries were excluded.

After a first review of citations and annotations, to weed out obviously irrelevant materials, the body of collected literature was subjected to two reviews: one to ensure that materials met the selection criteria, and a second by a peer review group to ensure that studies representative of the universe were included.

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I. CLASSIFICATION AND REPORTING SYSTEMS

Lerner, Monroe, and Nurco, David N. Drug abuse deaths in Baltimore, 1951-1966. The International Journal of the Addictions, 5(4): 693-715, December, 1970.

DRUG	Multi-Drug
SAMPLE SIZE	464
SAMPLE TYPE	Drug Deaths
AGE	Cross-Age
SEX	Both Male and Female
ETHNICITY	Cross-Cultural
GEOGRAPHICAL AREA	Baltimore, Maryland
METHODOLOGY	Statistical Survey
DATA COLLECTION INSTRUMENT	Program/Clinic Statistics
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	7

SUMMARY

There appears to be a considerable degree of mystery about what happens to drug abusers and addicts as they reach the period of mid-life and beyond. Nevertheless, it seems probable that many chronic drug abusers or addicts who "disappear from view" may actually have died. However, it is hard to document this statement, largely because these deaths are not necessarily attributed in the mortality records or in the statistics to drugs, whether through accidental overdose or chronic long-term poisoning. In view of the high mortality risk of addicts, and to throw some light on the

circumstances under which addicts die, the authors studied the drug deaths reported to the Office of the Chief Medical Examiner (OCME) of the State of Maryland since January 1, 1951.

OCME investigates those deaths occurring in the city of Baltimore which are believed to be the result of homicide, poisoning, suicide, criminal abortion, rape, or drowning. It also investigates accidental deaths and deaths which occur under unusual or suspicious circumstances. If the investigating Medical Examiner is able to establish the cause of death beyond reasonable doubt, a death certificate is issued and the body is released. However, if there is some question as to the cause of death, the Medical Examiner may order an autopsy. Narcotics cases are routinely reported to OCME. Data for the present study consisted of the records of 464 "drug deaths" occurring in the Baltimore Metropolitan Area from 1951 through part of 1966, and which had been routinely referred to OCME.

METHODOLOGY

During the period of this study, the "cause of death" for each death occurring in the United States was determined according to procedures recommended by the International Conference for the Seventh Revision of the International List of Diseases and Causes of Death, held in Paris under World Health Organization auspices February 21-26, 1955, and adopted by the Ninth World Health Assembly under W.H.O. Nomenclature Regulations.

International List Coding Method

The cause of death determined in the above manner is usually classified according to a 3-digit code (Detailed List). However, deaths due to accident (including adverse reaction to therapeutic misadventure), poisoning, or violence are classified into two 3-digit codes, one of these a classification according to the external cause of death ("E" Code), and the other according to the nature of the injury resulting in death ("N"Code). These classifications are independent of each other, and either or both can be, and are, used for tabulation of mortality statistics and for analysis.

Although the E Code classifies the deaths due to accident, poisoning or violence according to "external cause," this classification actually cuts across a number of different axes, thus leading inevitably to some confusion in its use. Thus the external cause classification distinguishes among deaths according to intent, time since the injury, and circumstances. Most deaths reported to the Office of the Chief Medical Examiner and identified there as drug deaths were classified as Suicide and self-inflicted injury,

followed by Accidental poisonings. Here the question of intent was crucial. Only a small number of these deaths were classified as Non-accidental poisoning by another person. The category Therapeutic misadventures in anaesthesia was excluded from many of the analyses in the present study.

Under the N code, all drug deaths fall under: Effects of poisons; Reactions and complications due to non-therapeutic medical and surgical procedures; Adverse reaction to injections, infusions, and transfusions for therapeutic purposes; and Adverse reaction to other therapeutic procedures. Although the possibility of ambiguity here is considerably less than with the E code, the potential usefulness of the classification is also considerably less, primarily because of the broadness of these categories.

Although these International List methods of coding appear to be satisfactory for most requirements of mortality analysis, they clearly do not provide the kind of classification or detail required for understanding drug abuse deaths. As a result, the present study developed its own cause-of-death code for drug-abuse deaths (here designated as the "OCME" code). In this code, deaths are classified by type (accident, suicide, homicide, or undetermined), but primary emphasis is on the identification of the individual drug, or class of drug, as determined by the Medical Examiner. The OCME code categories for class of drug are as follows:

Opiates

Narcotic (unspecified)

Barbiturates

Hypnotics

Tranquilizers

Salicylates

Anaesthesia

Others

FINDINGS

Most of the 386 drug deaths (excluding those from anaesthesia) occurring during 1951-1966 in the Baltimore Metropolitan Area and reported to the Office of the Chief Medical Examiner of the State of Maryland were from barbiturates (about 70% of the total) with opiates and narcotics(unspecified) accounting for about another 10%, hypnotics about 8%, salicylates about 7%, and tranquilizers

only about 1%. The trend in annual number of deaths has been upward; barbiturates decreased as a proportion of the total of all drug deaths over this period, while opiates and narcotics (unspecified) increased.

A slight majority of these deaths occurred to females; about 60% occurred at ages 40 and over; and a vast majority occurred to White persons (84%) and to residents of Baltimore City. In the latter group -- drug deaths among residents of Baltimore City -- almost three-fifths occurred to Central City residents, with another one-fifth occurring to residents of the Northwest area. About three-fifths of the drug deaths in this experience were classified as suicide, with about another one-fifth each classified as accident and as undetermined or unknown.

CONCLUSIONS

There appears to be a fair degree of correspondence between the E, N, and OCME Codes; for present purposes, however, the OCME was most useful. The analysis which is possible using this code does appear to give a fairly comprehensive picture of drug deaths. Obviously more studies of this type, in other cities and internationally, would help to provide a much better picture of the life cycle of the drug abuser than any which is currently available. This is particularly important if drug abuse is to be recognized as primarily a medical and social rather than an enforcement problem, and if, as a result, the resources of the entire medical and health establishments are to be used to assist in coping with it. Programs in medical education especially, aimed at both the medical student and the medical practitioner, require the kind of knowledge which studies of this type can provide.

Gottschalk, Louis A., et al. The Development of a Uniform System for Reporting and Recording Drug-Related Deaths. Orange, California: Research and Education Foundation, Orange County Medical Center, Psychiatry Department, June 25, 1973. Volume 1, 405 pp. Volume 2, Appendices.

DRUG	Multi-Drug
SAMPLE SIZE	170 Coroners' Offices
SAMPLE TYPE	Coroners, Medical Examiners
AGE	Not Specified
SEX	Not Specified
ETHNICITY	Cross-Cultural
GEOGRAPHICAL AREA	More Than Two Cities in the U.S.
METHODOLOGY	Survey
DATA COLLECTION INSTRUMENT	Interviews
DATE(S) CONDUCTED	1972-1973
NO. OF REFERENCES	Over 1,000

SUMMARY

This final report for a National Institute on Drug Abuse contract consists of a detailed description of the procedures followed in an attempt to develop a uniform method of reporting drug-involved deaths. The researchers felt that standardization of such reports is essential to develop a firm national data base on drug-involved deaths for use by those concerned with drug abuse prevention. Extensive bibliographic references and sources are provided in the appendices, as are lists of therapeutic and fatal blood levels of various drugs.

METHODOLOGY

A total of 170 offices (Coroners; Medical Examiners, Departments of Pathology, Toxicology or Pharmacology; and State Health Departments) across the United States were surveyed with respect to their systems of recording and reporting drug induced and drug-related deaths. The responding parties were also questioned regarding their methods of ascertaining if, in fact, a drug substance was in some way related to the death. A sample of unrepresentative responses is given, reflecting the diversity of approaches adopted in various states. This diversity occurs in respect to amount of information recorded; degree of sophistication in methods of retrieving such information; methods of classification of cause of death; laboratory tests used; and terminology.

FINDINGS

The results of this initial phase led the researchers to conclude that the system to be developed should be aimed for use by those official examining bodies as well as by private physicians signing death certificates.

Although the procedures followed in those offices visited were essentially the same, there were large differences in the quality and number of autopsies and toxicological tests performed. This variability was explained in terms of the amount of funds available for such examinations.

Twenty Coroners' and Medical Examiners' Offices, in a variety of states, were visited, and their principal medical experts were interviewed. The reports of these interviews are included in their entirety.

An interdisciplinary conference was held to solicit advice on a number of major problems and goals of this project. Highlights of the papers presented are summarized in this final report. A tentative form for reporting and recording drug-related deaths was developed at this conference.

Operational definitions of terms such as "drug-induced" and "drug-related" which were to be used in the final reporting system were developed, in order to assure standardization in filling out the final form.

CONCLUSIONS

The final product is a 24 item-form to be completed by the examining official. The information requested includes educational, occupational, military, marital, criminal, and drug-taking histories. The form is arranged so that all information may be coded and therefore easily stored in a computer bank. Extensive code lists are provided for this purpose.

All 20 official sites visited responded positively to the suggestion that they be involved in a pilot study to test the proposed form. Three of these offices were selected as the most appropriate for such purposes. The authors recommend that a feasibility study be undertaken by them, with the approval of NIMH.

II. SUICIDE AND HOMICIDE

Laskowitz, David, and Jones, Ferdinand. A comparison of the Rorschach behavior of adolescent addicts who have died of an overdose with addict controls. In: Harms, Ernest, ed. Drug Addiction in Youth. New York: Pergamon Press, 1965. pp. 99-106.

DRUG	Heroin
SAMPLE SIZE	48
SAMPLE TYPE	Treatment (inpatient)
AGE	Adolescents (16-21)
SEX	Male
ETHNICITY	25% Black; 29% Puerto Rican; 46% White
GEOGRAPHICAL AREA	New York City, New York
METHODOLOGY	Controlled/Experimental
DATA COLLECTION INSTRUMENT	Program/Clinic Statistics; Psychological Tests
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	8

SUMMARY

This exploratory study addressed the question of whether the DOD (Death-by-Overdose) group is more self-destructive than a control group as reflected in Rorschach behavior. In setting up the study it was recognized at the outset that it is an unwarranted inductive leap to assume that death-by-overdose necessarily implies intentional suicidal behavior. Since so little is known about the process of self-destruction, it was thought to be of value if the Rorschach protocols of ex-patients who died of an overdose were compared with those of matched patient peers.

METHODOLOGY

It was hypothesized that there would be no significant difference between the Rorschach response habits of the members of the overdose group and those of the control group. This was expected because although the heroin used by the addict is generally estimated at being only 1 to 3% pure, there is in fact no control for degree of adulteration when the "pusher" dilutes the heroin. There has also been the clinical impression that although adolescent drug users have a drug of choice, the impulse to get high is often so intense that there may be indiscriminate exploration with a wide array of intoxicants, based upon availability, with little regard for physiological consequence. It is therefore hypothesized that death by an overdose is a possible event among all drug users.

Rorschach data was collected retrospectively from the psychological test records of 24 adolescent male ex-patients who died from an overdose of heroin; all Rorschach protocols and case histories were drawn from the files of Riverside Hospital. Patient peers were selected to provide an approximate match with individuals of the DOD group with regard to Rorschach productivity, age, ethnicity and Full Scale Bellevue-Wechsler IQ (Form I).

Applying Osgood's analysis of the influence of suicidal motivation upon language behavior to an analysis of Rorschach protocols, 3 assumptions were made for the purpose of this study: (1) the Rorschach respondent who is potentially suicidal is functioning under a state of heightened motivation; (2) Rorschach perceptual habits, like habits in general, are organized into hierarchies of alternatives; and (3) increased drive has 2 distinct effects upon selection within such hierarchies: generalized energizing effects, and specific cue effect.

FINDINGS

In the main, there were, as predicted in the hypothesis, no significant differences between the DOD group and the controls, using the Rorschach sign approach. The notable exceptions were that the DOD group yielded whole responses (often with a secondary use of space), and gave more controlled color responses. The control group did yield significantly more popular responses than did the DOD group, suggesting greater communication with conventional patterns of thinking. There was no significant difference between the 2 groups in terms of level of impulsivity, physical energy (which potentially could be mobilized for self-destructive purposes), restlessness or agitation.

CONCLUSIONS

Whole responses from the DOD group might lead to the conjecture that members of the DOD group may have been better able to exploit the greater social feeling of persons about them, to press others into service while at the same time, in a self-defeating manner, frustrating the efforts of others to be of help.

Popular responses from the control group suggests that perhaps members of the control group were less capable of expressing their aggression outwardly out of concern with the retaliation that might be triggered by openly departing from socially acceptable behavior.

Sanborn, Donald E.; Casey, Thomas M.; and Niswander, G. Donald. Drug abusers, suicide attempters, and the MMPI. Diseases of the Nervous System, 32:183-187, March 1971.

DRUG	Hallucinogens, stimulants
SAMPLE SIZE	12 Drug abusers, 12 Suicide attempters
SAMPLE TYPE	Treatment (inpatient)
AGE	18-25
SEX	Male
ETHNICITY	Not specified
GEOGRAPHICAL AREA	Concord, New Hampshire
METHODOLOGY	Controlled
DATA COLLECTION INSTRUMENT	Psychological tests
DATE(S) CONDUCTED	
NO. OF REFERENCES	25

SUMMARY

For a pilot study, scores on the Minnesota Multiphasic Personality Inventory (MMPI) were compared for a group of male suicide attempters and a group of male drug abusers. The purpose of the study was to determine if there was any relationship among the personality characteristics between the two groups.

A table of diagnostic categories showed that half of the suicide attempters and 1/3 of the drug abusers were diagnosed as schizophrenics. The mean T score profiles for both groups on the MMPI were found to correlate significantly with each other, supporting the visual appearance of similarity.

One reason for this similarity of personality may be found in viewing both groups - drug abusers and suicide attempters - as ultimately doing the same thing, using different methods to manipulate the environment; methods that are essentially self-destructive.

METHODOLOGY

A sample of 24 males, 12 drug abusers and 12 suicide attempters, was drawn from consecutive admissions to the New Hampshire Hospital and administered the MMPI within two weeks of their admission. The criteria for inclusion in the study were: males, between the ages of 18 and 25, either a drug abuser with no history of suicidal attempts, or a suicide attempter with no history of drug abuse. Only drug abusers of hallucinogenic drugs (L.S.D., D.M.T.) and/or stimulants were used in this study. No narcotic addicts or alcoholics were included. All suicide attempters were those who had resorted to self-destructive behavior immediately preceding admission to the hospital. Suicide threats were not included.

The diagnostic categories for both groups were as follows:

- Adjustment Reaction of Adolescence
- Drug Dependence, Hallucinogens
- Personality Disorder
- Psychotic Depressive Reaction
- Schizophrenia (all types)
- Undiagnosed.

FINDINGS

Schizophrenia dominated the diagnostic categories; 10 out of the total sample of 24 were classified schizophrenic.

The mean scores of both groups were remarkably similar in appearance. A t-test showed no significant difference. Mean group scores correlated significantly at the .05 level.

The highest mean score for both groups occurred on the Pd scale; the lowest on the Hs and Si scales. The only noticeable divergences between

the two group's scores occurred on the Mania (Ma) and Paranoia (Pa) scales where the drug abuse group exhibited more pathology. On every scale but 2, D (depression) and Si (social introversion), the drug abuse group exhibited the same or more pathology than the suicide attempters.

CONCLUSIONS

The authors discussed the MMPI scores in eight earlier studies, and possible interpretations:

- The Si score was surprisingly low (ca. 55) for suicide attempters. This group did not consider itself socially introverted, contrary to sociological thinking. Perhaps the suicide attempter has a different social perception than the successful suicide.

- The high score (68) for drug abusers on the Pa scale confirmed the findings of other studies. Paranoid thinking has been associated with prolonged amphetamine use in other controlled studies.

- The drug abuser's group score of 68 on the Ma scale may reflect their action-oriented tendencies.

- The drug abusers in this study were very similar in their MMPI scores to scores reported in the literature on narcotics addicts.

- The high scores for both groups on the Pd scale may be due to youthful impulsivity and lack of concern for long-term consequences. For the drug abusers, however, the Pd elevation may have occurred because that scale is based on norms of society in general. Clinical observations by one of the authors showed that amphetamine and stimulant users are loyal and caring for one another but as a group they do not conform to societal norms.

- The norms for the Pd scale may be in need of revision in light of the large socio-cultural evolution of which drug abusers form a segment. Drug users tend to score as sociopaths on the scale (based on self-reports) while their behavior may be less sociopathic (e.g., manipulative) than an individual

who is occupied in the business world.

- The reason for the drug abuser's high score of 69 on the Sc scale may be due to the fact that all subjects were drawn from a psychiatric hospital. The high score could also be accounted for by Keeler's findings that the desire for hallucinogenic experiences correlates significantly with the incidence of schizophrenia.

Berger, F.M. Drugs and suicide in the United States. Clinical Pharmacology and Therapeutics, 8(2):219-223, March-April 1967.

DRUG	Barbiturates
SAMPLE SIZE	2666
SAMPLE TYPE	Suicides
AGE	Not Specified
SEX	Not Specified
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	Not Specified
METHODOLOGY	Statistical Study
DATA COLLECTION INSTRUMENT	Government Records
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	11

SUMMARY

Report of a study which was made to determine which drugs were responsible for a striking increase in suicide due to drugs. Until 1960 the most frequent means of committing suicide were firearms, hanging, and exhaust gases. From 1953 to 1963 the incidence of suicide due to these causes did not significantly change. However, during this same period suicides by drugs tripled, and by 1962 drugs ranked third among the methods used. Analysis of 20,819 deaths by suicide in a single year (1963) in the United States revealed that 2666 persons died from the use of drugs, and more than 75 percent of all suicidal deaths from drugs resulted from barbiturates.

METHODOLOGY

Data were obtained and analyzed from the United States Department of Health, Education and Welfare, Office of Vital Statistics, and from the National Prescription Audit, conducted by R. A. Gosselin and Company, Inc.

FINDINGS

Barbiturates were ranked highest in the order of drugs used for suicidal deaths in the 2666 cases studied, and the ratio of suicides was also highest for barbiturates. There were approximately 45 suicides for every one million barbiturate prescriptions, but approximately 1.4 suicides for each million tranquilizer prescriptions. In relation to the number of prescriptions written, the incidence of suicide with barbiturates was 32 times as great as that with tranquilizers. Three factors may play a role: (1) a difference in toxicity of the 2 classes of drugs; (2) occurrence of confusional states after barbiturates; and (3) the production of depression in predisposed persons by certain barbiturates, such as Phenobarbital.

CONCLUSIONS

Although the suicide rate has remained constant with population growth, the pattern of methods for suicide has changed markedly. The use of drugs for suicide has increased disproportionately, while other means have fallen out of favor. The available data indicate that the increased suicide rate from drugs is not due to the use of the widely prescribed nonbarbiturate hypnotics and tranquilizers, but can be accounted for entirely by the use of barbiturates.

Ross, Mathew. Suicide among physicians. Psychiatry in Medicine, 2(3): 189-198, July, 1971. (71 references).

SUMMARY

This paper presented a composite picture of the type of physician, particularly in the United States, considered to be a high suicide risk. A review of the international literature over the past 75 years has brought forth some idea of the nature of the personality and problems of the physician who would be most likely to commit suicide.

The author also offered ideas for prevention of suicide among physicians and medical students.

Suggestions for dealing with the physician as patient, with particular emphasis on the nature of psychotherapy, were also presented.

FINDINGS

A review of the literature produced the following information: Suicide appeared to be an extraordinarily high risk for the doctor. The rate is highest in Denmark. Physicians commit suicide at an earlier age than the rest of the population. United States physicians use drugs far more frequently in suicide than do their counterparts in the general population. In the United States the suicide rate among female physicians is higher than among male physicians. There is considerable variation in the rate of suicide among various specialities: psychiatry, opthalmology, and anesthesiology have the highest rates. None of the physicians who committed suicide was considered to be in good mental health. Less than 1/2 enjoyed good physical health.

Studies indicated a high incidence of alcohol and drug use among suicidal physicians. The physician who has established a dependency on alcohol represents a high risk of becoming a drug addict. Drug dependence may be associated with depression and also with manic-depressive illness. The pharmacologic effects of drugs are said to increase feelings of omnipotence, and this sense of omnipotence may promote a feeling of immunity to death or to actual suicide. Drug abuse was associated with 20% of physician suicides. International reports indicated that, of known drug addicts, about 15% are physicians.

Among medical students, suicide is the second most common cause of death. Studies of psychiatric difficulties among medical students have not produced exact statistics, but for the past 35 years it has been assumed to be high. The medical student does not take the opportunity to turn to the psychiatrist when his problems become severe, perhaps because of a subtly demeaning attitude toward emotional illness.

Certain early signs of emotional disturbance among doctors were found: a hurried existence, self-doubts about ordinary medical procedures, extensive tension when confronted with difficult diagnostic problems, gradual neglect of practice. Personality changes were noted by colleagues from 2 to 4 months before a physician's suicide.

CONCLUSIONS

The author suggested greater emphasis on psychiatric screening for medical students. Improved standards in teaching psychiatry, as well as a review of educational programs concerning suicide, alcohol, and drugs were thought to be helpful. Psychiatric treatment for severely emotionally disturbed physicians should be strongly recommended, and care should be taken to avoid special consideration for such patients. Particular methods of psychotherapy, involving open discussion of a physician-patient's suicidal thoughts, were suggested.

Ianzito, Benjamin M. Attempted suicide by drug ingestion. Diseases of the Nervous System, 31(7):453-458, July, 1970.

DRUG	Multi-Drug, Depressants
SAMPLE SIZE	95
SAMPLE TYPE	Treatment (inpatient)
AGE	Adults, 72% under 40
SEX	76% Female
ETHNICITY	90 White, 5 Not Specified
GEOGRAPHICAL AREA	Providence, Rhode Island
METHODOLOGY	Case Study
DATA COLLECTION INSTRUMENT	Program/Clinic Statistics and Records
DATE(S) CONDUCTED	1968
NO. OF REFERENCES	13

SUMMARY

The author reviewed 95 cases of apparent suicide attempt by drug ingestion. All patients admitted in 1968 for intentional drug overdose to Rhode Island Hospital, Providence, were included. The typical drug ingester was seen to be a married housewife in her twenties with problems of interpersonal relations and a prior psychiatric history. Commonly prescribed sedative-hypnotic medications were most often employed. However, considerable variation from this

"average" type occurred.

A discussion of the implications of a suicide attempt by drug ingestion was presented, with emphasis on the problems of determining intent. Suggestions were made regarding immediate medical management (a maintenance I. V., close monitoring of vital signs, usual nursing precautions) and guidelines were presented for psychiatric evaluation of the patient upon recovery from the effects of the drug.

METHODOLOGY

All patients admitted to the Rhode Island Hospital during 1968 because of intentional drug overdose were included in the study. The 95 cases examined were those in which there was ingestion of medication in quantities greater than maximum recommended therapeutic dose, within 24 hours prior to admission, and with intent to cause self-harm or destruction.

The records of the 95 patients were reviewed with emphasis on 20 specific parameters, including: age, sex, race, marital status, occupation, religious denomination, month of admission, patient admitted to service or private care. Less objective data, such as motives and intent, were difficult to evaluate. Information regarding mental status after recovery was obtained, as was information regarding prior attempts, previous psychiatric hospitalization, and current psychiatric care. The types of medication used were determined in all cases, and were divided into major categories by drug type. Source of the drug was also considered, when determinable. Degree of consciousness was divided into 6 categories which represented the patient's condition on admission. Length of stay, treatment given in hospital, and disposition at discharge were also recorded.

FINDINGS

The typical patient was a White female in her twenties. In all age groups the females were more numerous, and they comprised 76% of the total cases. Ninety (95%) of the patients were White. Most of the patients were not married at the time of drug ingestion; many were divorced (22). Forty-one were housewives, and 5 others were unemployed. The majority of patients were Roman Catholic.

Nearly half (48%) of the patients cited problems of interpersonal relations as the precipitating event in their suicide attempts. When intent could be evaluated, 45 (70%) were thought to be gestures and 19

(30%) were considered serious attempts.

Barbiturates were the most commonly employed type of drug, but glutethimide (Doriden) was the most frequently employed specific compound. A common choice among minor tranquilizers was chlordiazepoxide (Librium). Multiple drugs were employed in 1/3 of the cases. The majority of drugs used were prescription medication, and at least 1/3 had been prescribed by the patient's own physician.

The level of consciousness on admission varied from fully alert to apneic. Patients who were semi-comatose composed 1/4 of the cases. Only 12% were comatose or apneic. The majority of patients received only supportive care, 15 requiring initial treatment in the intensive care unit. One third received antidepressants or phenothiazines and 3 patients required electroconvulsive therapy. Two-thirds of the patients were hospitalized for less than a week; only 8 remained longer than 2 weeks.

CONCLUSIONS

High incidence of attempts among females was anticipated from previous studies, and it closely parallels national statistics. The religious and racial percentages closely approximated the percentages by religion and race of general admissions, and reflected the population served by the hospital. The author felt that there was no reliable evidence for the ebb and rise of suicide attempts, and that time variations could represent a fluctuation of admitting policy.

While the author pointed out that the majority of attempts were "gestures," he felt the evaluation of intent suffered from a lack of objective guidelines. He suggested that between "serious attempt" and "gesture" there is a middle ground of "gambles," in which the patient is uncertain of the consequences of his action, but believes there is some chance of death. The author recommends caution, served by a period of observation, if intent is uncertain. He feels every patient should be seen by a psychiatrist and each should have a mental status examination.

It was noteworthy that 39% of the cases studied had a history of prior attempts. This reflected the well-known high recurrence rate of suicide attempts. The choice of medication was usually a drug prescribed for sleep. This may have represented only the "effective" attempts, i.e., the ones resulting in admission.

The author stated that specific treatment for overdosage varies with medication, but the mainstays of initial therapy are support and observation. Induced vomiting and gastric lavage are usually inadvisable in the comatose patient. A maintenance I.V., close monitoring of vital signs, and usual nursing precautions constitute adequate care for moderate overdoses. In heavy overdoses assisted ventilation is often required, or the use of prolonged hemodialysis, forced diuresis, or peritoneal dialysis.

A protracted study of the patients examined was felt to be of interest to determine the success of psychiatric care and the incidence of eventual suicide. The author noted that 1/3 of the patients studied lacked psychiatric diagnosis on discharge. Since suicidal behavior is a symptom, "drug ingestion" alone is an incomplete diagnosis and the psychiatric diagnosis should be expressed in all cases.

Frederick, Calvin J.; Resnik, Harvey L.; and Wittlin, Byron J. Self-destructive aspects of hard core addiction. Archives of General Psychiatry, 28:579-585, April, 1973.

DRUG	Heroin and Methadone
SAMPLE SIZE	268
SAMPLE TYPE	50% Treatment (outpatient) 50% Treatment (inpatient)
AGE	Age 15 to 26 years
SEX	Both Male and Female
ETHNICITY	Black and White
GEOGRAPHICAL AREA	Washington, D.C. and Maryland
METHODOLOGY	Controlled/Experimental
DATA COLLECTION INSTRUMENT	Questionnaires
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	21

SUMMARY

This study was undertaken with the cooperation of the District of Columbia Narcotics Treatment Administration. Experimental subjects and control groups were used, 268 persons in all, ranging in age from 15 to 26 years. Indications of depression, suicidal behavior, and attitudes toward death, dying and violent behavior were assessed by a Morbidity Attitude Survey Scale and a Depression Scale. Experimental subjects were 98 hard core addicts who had been in a methadone treatment program less than 3 months. Results indicated distinct evidence of depression among the addicted

group when compared with controls, greater incidence of suicide attempts among addicts than in control groups, with the exception of Blacks. Methadone appeared to be helpful as a palliative, but not as a cure.

METHODOLOGY

A preliminary Morbidity Attitude Survey Scale (MASS) consisting of 20 questions was given. Seven items were taken from the Self-Rating Depression Scale (SDS) developed by Zung. A short form of the Zung Scale (SSDS) was developed and incorporated into the MASS to assess the depressive components among addicts, non-addicts, and controls.

Subjects for the study were 268 persons, ranging in age from 15 to 26 for all groups. They were taken from the District of Columbia and suburban Maryland. Experimental subjects were 98 hard core addicts who had been in a methadone treatment program less than 3 months. The sample was 95% Black.

Addicted subjects were either in a methadone group or in an abstinence program (without methadone, but had previously used methadone). All those in this study were being treated for heroin addiction.

Several control groups were used to control for race, cultural, and religious influences, and to explore general attitudes toward drugs and morbidity among today's young people. Both sexes were represented in all groups except the abstinence group, which was all male.

The following hypotheses were tested: (1) addicts will show a greater tendency toward depression than non-addicts; (2) addicts on methadone will show less depression than those not on methadone, and (3) addicts will have different attitudes toward death, dying, and violent behavior than non-addicts.

FINDINGS

The 3 essential hypotheses all tended to be confirmed. Addicts in general are more depressed than non-addicts in young groups, whether on methadone or abstinent. In all control groups, at least 2/3rds of the samples scored in a normal range on the Depression Scale, whereas less than 1/2 scored in that range among both drug-addiction groups.

Addicts are more self-destructive than non-addicts. Past behavior discloses a significantly greater number of suicide attempts among addicts than most of the other control groups. Only the Black controls reported a suicide-attempt rate in proportions similar to the addict groups.

Addicts have more aberrant attitudes toward life and death than non-addicts. Risk-taking behavior typical of addicts is consistent with a deviant attitude towards life and death.

The study also found that being Black adds to the problem of addiction. Throughout the results, a greater difference appears between addicted groups and White controls than among Black controls.

Also, methadone appeared to act as a palliative, not as a cure. It reduces depression and attitudes towards violence, aggression and morbidity. It was found to be an aid to holding aberrant thoughts in abeyance. Results indicated that methadone may be helpful temporarily in bringing about a more positive attitude.

CONCLUSIONS

The writers suggested that addicts ought to be helped to find substitutes in effective living rather than drug replacement. These would include psychotherapy, new friends, new jobs, job training programs, and new geographical placement.

The writers indicated that further studies should be done on addicts before and after the addiction process. They hoped that the results and recommendations made from this study would lead to additional experimental and clinical work.

Baden, Michael M. Homicide, suicide, and accidental death among narcotic addicts. Human Pathology, 31(1):91-95, March, 1972.

DRUG	Opiates
SAMPLE SIZE	6 Case Studies
SAMPLE TYPE	Drug Deaths
AGE	Adults
SEX	Both Male and Female
ETHNICITY	1 Puerto Rican, 3 White, 2 Not Specified
GEOGRAPHICAL AREA	New York, New York
METHODOLOGY	Case Studies
DATA COLLECTION INSTRUMENT	Observations
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	8

SUMMARY

Violent death is in high incidence among narcotic addicts. Investigation of the cause of death includes examination of the scene and circumstances of death , the obtaining of a pertinent history from friends, relatives, and police, an autopsy by a qualified forensic pathologist, and extensive toxicologic analyses. The association of violent death and addiction is sometimes overlooked or not recorded when the drug use does not directly cause death.

The author reviewed 6 case studies as examples of patterns of homicide, suicide, and accidental death. The most common mode of violent death among addicts was homicide. Of 3800 victims of homicides during 1969, 1970, and 1971 in New York City, 500 were addicts. The author suggested that drug addiction might be considered a suicidal equivalent: The most common means of suicide among addicts was jumping from a height. The majority of accidental deaths among narcotic addicts were reported to be falls from heights and motor vehicle fatalities. Another common form of accidental death found was alcoholism. The author stated that the association of addiction and violent death is not necessarily a cause-and-effect relationship.

METHODOLOGY

In New York City, the Office of the Chief Medical Examiner has official responsibility for the investigation of all deaths that are apparently or possibly due to unnatural causes. The author served as a deputy in this office and was able to draw upon case studies and research to reach his conclusions. In the case studies initial findings were recorded as well as additional findings by autopsy. Studied were homicide, suicide, and accidental death.

FINDINGS

Among addicts, the most common mode of violent death was homicide. Of 3800 victims of homicides in New York City during 1969, 1970, and 1971, 500 were addicts. Gunshot wounds accounted for 65% of homicides among addicts, and the greatest number of homicides were among males and Blacks. The most common means of suicide was found to be jumping from a height.

In 1970, out of 100,000 prison admissions, ten suicides by hanging occurred in New York City prisons, and 7 of these were by addicts. Fifty percent of all prisoners were addicts; however, the incidence of successful suicide in the prison situation was low (an annual average of 10 during the last 11 years).

Falls from heights and motor vehicle fatalities constituted the majority of accidental deaths among narcotic addicts. Falls from buildings were usually incidental to attempts to burglarize apartments. Unsuspected subdural hemorrhage, brain injuries, and skull fractures resulting from falls or assaults might also be found at autopsy; such

deaths are similar to those seen in alcoholics. More than 20% of heroin addicts had evidence from histories or autopsy findings of concomitant chronic alcoholism, and addicts sometimes died of alcoholism. In 1971, 41 such deaths occurred. Cirrhosis of the liver in addicts was much more commonly the result of alcoholism than of prior hepatitis. The incidence of homicide, suicide, and death due to accidents or multiple drug abuse remained high for growing numbers of addicts in methadone maintenance programs.

CONCLUSIONS

The author stated that the association of addiction and violent death was not necessarily a cause-and-effect relationship. He suggested both may be independent expressions of underlying social problems. It was recommended that the post-mortem examination is necessary not only to detect unsuspected homicide, but also to identify deaths due to narcotic use that may initially appear homicidal. The high incidence in addict populations of occult traumatic death mandates thorough post-mortem investigation of all drug related deaths.

The author suggested that drug addiction can be considered a suicidal equivalent. Many addicts showed histories of suicide attempts, and old wrist incisions were not uncommonly found at autopsy.

Ellinwood, Everett H., Jr. Assault and homicide associated with amphetamine abuse. American Journal of Psychiatry, 127(9): 1170-1175, March, 1971.

DRUG	Amphetamines
SAMPLE SIZE	13
SAMPLE TYPE	Homicides
AGE	Adults
SEX	Both Male and Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	Not Specified
METHODOLOGY	Case Study
DATA COLLECTION INSTRUMENT	Interviews
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	12

SUMMARY

This article discusses possible relationships between amphetamine abuse and violent behavior, with emphasis on homicide. Some data are included involving amphetamine abuse and other forms of violent behavior: assault, rape, kidnapping and attempted homicide.

Thirteen homicides are described. In all the cases it was possible to establish that at least one of the parties involved was under the influence of amphetamines at the time of the incident. Participants in 4 of the cases were examined by the author. Reports from other

investigators were utilized in the remaining cases. The participants were between 20 and 30 years of age in 10 of the 13 incidents. Three cases are described in detail.

Other factors that were contributory to violent behavior are discussed briefly. Most important among these factors, in the author's opinion, are: (1) predisposing personality, (2) environmental conditions, and (3) the use of other drugs. Sleep deprivation, and the tendency of some amphetamine users to carry weapons, are also mentioned as factors that may be of significance.

The author concludes that there are specific cases in which homicide can be directly related to "amphetamine induced delusional process and/or state of emotional lability," but that there is not sufficient data available to make any general statements with regard to amphetamine abuse and homicide or other types of violent behavior. He urges routine urine examination of persons arrested for violent crimes in order to determine the presence or absence of drugs.

METHODOLOGY

Four of the cases cited were studied directly by the author. The direct studies consisted of interviews and examination of case histories. Nine of the cases were studied on the basis of case histories alone. No control or comparison group was utilized. Data relating to amphetamine abuse and violent behavior other than homicides were obtained exclusively from examination of case histories.

FINDINGS

The cases studied indicate that amphetamine abuse may be a major factor in some instances of violent behavior, but the author indicates that the other factors involved in every case examined make it impossible to isolate amphetamine abuse as a sole cause of violent behavior in any of the cases studied.

CONCLUSIONS

The author indicates that a lack of hard data makes it difficult to establish a direct relationship between amphetamine abuse except in specific cases where the influence of amphetamines at the time of the actual overt act can be clearly established. He favors urinalysis of persons arrested for violent crimes at the time of arrest to determine what, if any, drugs are present.

III. OPIATE RELATED DEATH: INCIDENCE AND CAUSE

The "heroin overdose" mystery and other occupational hazards of addiction. In: Brecher, Edward M., and the editors of Consumer Reports, Licit and Illicit Drugs. Boston: Little, Brown and Co., 1972. pp. 101-114. (54 references).

SUMMARY

The most publicized hazard associated with heroin addiction, death from "heroin overdose," is considered. Increasing concern over such deaths combined with a lack of understanding of all the factors involved led to a review of the data with a focus on New York City.

In New York City it was reported that narcotics, chiefly heroin, were the leading cause of death in 1969 and 1970 among all males aged 15 to 35, including nonaddicts. Such statistics have warranted much concern.

Two methods were presented to prevent death from heroin overdose: warning addicts to take only their usual dose of heroin, and the use of nalorphine as an antidote.

Evidence is presented that deaths attributed to heroin overdose are not due to heroin overdose. Three statements are considered.

Why These Deaths Cannot Be Due to Overdose

To support this statement, studies are cited which indicate it would take 500 milligrams or more (50 full bags administered in a single injection) to kill an unaddicted human adult. Enormous amounts of morphine or heroin do not kill addicts, who have already developed a tolerance for opiates. A sudden increase in dosage does not produce significant side effects, much less death, among addicts.

There Is No Evidence to Show That Deaths Attributed to Overdose Are In Fact So Caused

A conscientious search of the U.S. medical literature throughout recent decades has failed to turn up a single scientific paper reporting that heroin overdose, as established by medical or other reasonable methods of determining overdose, is in fact a cause of death among American heroin addicts.

About 30 years ago, coroners and medical examiners began the custom of labeling as "heroin overdose" all deaths among heroin addicts where the true cause could not be determined. In the early 40's a new kind of death began to make its appearance among heroin addicts. Death was sudden and marked by pulmonary and cerebral edema. The cause of this new kind of death remains unknown today.

Evidence is Plentiful that These Deaths Are Not Due to Overdose

Based on data gathered by Helpern and Baden, Medical Examiners for New York City, six reasons are given which do not support the "overdose" theory.

1. Heroin packets found near dead addicts have no qualitative or quantitative difference from ordinary packets.

2. Syringes used by addicts prior to death do not contain more heroin than usual.

3. The urine of alleged overdose addicts shows no evidence of overdose.

4. Tissues surrounding the fatal injection site show no sign of high heroin concentration.

5. Those dying of alleged overdose are long-term users, not neophytes unaccustomed to heroin.

6. Although addicts often inject in a group, using the same heroin supply, rarely does more than one die at such a time.

THEORY

Most of these deaths are characterized by suddenness, by pulmonary edema, and cerebral edema. The author labels these deaths "Syndrome X" and cites two possible explanations.

One theory is that Syndrome X deaths are caused by the quinine that has become a standard adulterant of heroin in New York City. It has been suggested that the only comparable drug to heroin which causes rapid death with pulmonary edema is quinine. A connection with heroin death is possible.

Alcohol is a second possible cause. Cases are mentioned where addicts already laden with alcohol or barbiturates injected heroin and died suddenly. Addicts have, for some time, stated that the use of narcotics and alcohol in combination is dangerous and could lead to death.

Addicts only turn to alcohol when deprived of their opiate or when trying to "kick" the habit. The recent sharp increase in Syndrome X deaths might be explained by an increased tendency to alternate alcohol or barbiturates with heroin as a result of high heroin prices.

Drs. McCusker and Cherubin have reported results of tests on addicts who had died; in 43 percent of the cases tested, alcohol was found in the body. Dr. Gay of Haight-Ashbury Medical Clinic has tentatively set forth the same theory.

British drug authorities have found that many British addicts who die have taken barbiturates and opiates at the same time.

The author suggests simple experiments on monkeys to test out his theory: addict the monkeys, intoxicate them on alcohol or barbiturates, inject heroin and see if they, in fact, do suddenly die.

CONCLUSION

If the Syndrome X is a result of quinine, then responsibility rests with the American black-market. If death is due to alcohol-barbiturates, again the black market is partially responsible for the high cost of heroin, forcing the addict to turn to alcohol-barbiturates.

Two steps are suggested; stop labeling these deaths as overdose, and launch an intensive clinical and experimental search for the true cause of these deaths.

Wilson, Edward F., and Fisher, Russell S. Death from narcotics use: Baltimore city, 1963 through 1968. Maryland State Medical Journal, 18(10):49-52, 1969.

DRUG	Opiates
SAMPLE SIZE	9
SAMPLE TYPE	Narcotic deaths
AGE	8 Adults; 1 Adolescent
SEX	9 Male
ETHNICITY	8 Black; 1 White
GEOGRAPHICAL AREA	Baltimore, Maryland
METHODOLOGY	Case Studies; Statistical Survey
DATA COLLECTION INSTRUMENT	Medical Records
DATE(S) CONDUCTED	1963-1968
NO. OF REFERENCES	10

SUMMARY

The authors documented Baltimore City's staggering increase in the number of deaths attributed directly to the use of narcotics during 1968.

The report includes 5 tables of statistical data: (1) narcotics deaths by race and sex; (2) narcotics deaths by age group; (3) race, sex, and age group of narcotics deaths; (4) age group of persons arrested on narcotic charges by Baltimore City police; and (5) drugs used from arrest experience of Baltimore City Police. Nine case histories of sudden death following intravenous injection are reported.

METHODOLOGY

Each "narcotic" death in the log books from 1963 through 1968 was examined. Every death attributed to narcotics in Baltimore City is autopsied at the Office of the Chief Medical Examiner, and the toxicology necessary to identify and quantitate the naturally occurring and synthetic narcotics in the body fluids and tissues is performed in its laboratory. When the cause of death is determined the death certificate is completed and the cause of death is also recorded in the daily log maintained by the medical examiners' secretaries.

FINDINGS

The number of narcotics deaths from 1963 through 1966 averaged approximately 8 per year. In 1967 they numbered 17, more than twice the former average. In 1969 they totaled 47, approximately 3 times the number in 1967. With one exception, the increase in narcotics deaths from 1967 to 1968 was confined to the ages 12 through 29. The increase in the number of narcotics deaths in the 15 through 19 age group was proportionally greater than in the 20 through 29 age group. Comparing 1967 to 1968, Black men and Black women accounted for over two thirds of the increase in total narcotics deaths and for over three fourths of the increase in teenage narcotics deaths.

The increase in the number of narcotics deaths is believed to reflect directly the increase in the number of narcotics users, also shown by the increase in arrests for the sale and possession of narcotics.

The report described 9 cases illustrative of sudden and unexpected death following intravenous narcotic injection. Of the 9 males, 6 had been released from a penal institution from 2 to 5 days prior to their death. One was still serving time.

CONCLUSIONS

Overdosage with heroin, contained in the mixture injected, accounts for most of the unexpected and sudden deaths, but probably not for all. The problem of variable heroin concentration of the mixture injected, the contribution of the non-narcotic portion of the non-narcotic mixture injected, and the frequency and strength of the narcotics injections taken shortly before death and in the previous period must be considered, as well as the factor of tolerance for heroin which may have been lost during a period of abstinence. Some such deaths are probably the result of an idiosyncratic reaction to the injected material. When death was so rapid that the needle and syringe were still in the skin, toxicologic examination of body fluids and tissues has demonstrated only the presence of alkaloid, not overdosage. In deaths immediately following intravenous narcotic injection, rarely is there no evidence of alkaloid in the body fluids or tissues.

Wetli, Charles V.; Davis, Joseph H.; and Blackbourne, Brian A. Narcotic addiction in Dade County, Florida: An analysis of 100 consecutive autopsies. Archives of Pathology, 93(4):330-343, April, 1972.

DRUG	Multi-Drug
SAMPLE SIZE	100
SAMPLE TYPE	Narcotic-Related Deaths
AGE	Cross-Age
SEX	75 Male and 25 Female
ETHNICITY	20% Black, 60% White, 20% Other
GEOGRAPHICAL AREA	Dade County, Florida
METHODOLOGY	Case Studies
DATA COLLECTION INSTRUMENT	Autopsy Reports, Toxicological Analyses, and Police and Hospital Records
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	43

SUMMARY

The purpose of this paper on narcotic addiction in Dade County was fourfold: (1) to better acquaint the general pathologist with the morphologic features of illicit narcotic use; (2) to compare and contrast the narcotic-related deaths in this community to those reported from other areas of the United States; (3) to better delineate some of the characteristic features found at autopsy; and (4) to emphasize the role of the reticuloendothelial system in chronic narcotic addiction. Demographic and autopsy data were

studied from 100 narcotic-related deaths classified as such by the Office of the Dade County Medical Examiner from January, 1967, through March, 1971.

METHODOLOGY

Case records including autopsy reports, toxicological analyses, and police and hospital records were reviewed. Routine hematoxylin-eosin-stained microscopic sections from each case were examined with light microscopy and with polarized light to facilitate identification of foreign material.

FINDINGS

Demographic characteristics

During the period under study, narcotic-related deaths steadily increased in Dade County, with a sudden upsurge in 1969. Of the deaths studied, 3/4ths were men, and the average age was 26 years. Non-Whites accounted for only 20% of the deaths. Approximately 20% of the Whites had Spanish surnames, reflecting the Cuban population of the Miami area.

Cause of death

Deaths resulted from untoward drug reactions or overdose in 86% of the cases; trauma, including suicide in 13%; and hepatitis in 1%. The narcotic most frequently injected was heroin.

Autopsy findings

Pulmonary edema was characteristic of deaths resulting directly from narcotic abuse. The most characteristic external observation at autopsy was the presence of white or pink frothy fluid exuding from the nose and mouth. Only rarely was cachexia a striking feature. Internally generalized visceral congestion was common. The paper included a table on the general autopsy findings in intravenous narcotism. The pathology of the skin, peripheral vessels, lungs, liver, spleen, and lymph nodes were discussed in detail. The most consistent findings of chronic narcotism at autopsy were needle tracks, hepatosplenomegaly, and hyperplasia of lymph nodes in the porta hepatis. Chronic hepatitis was nearly universal. Polarizable excipient was seen in 30% of the cases. Morphologic changes in the reticuloendothelial system suggested that addicts are constantly exposed to the virus of serum hepatitis and to a variety of other antigenic stimuli.

CONCLUSIONS

Within the past decade, especially the latter half, narcotic addiction has become a complex and widespread problem. The general pathologist may encounter it in his routine surgical and autopsy

material and should be familiar with the morphologic manifestations of narcotism.

Sapira, Joseph D.; Ball, John C.; and Penn, Harry. Causes of death among institutionalized narcotic addicts. Journal of Chronic Diseases, 22:733-742, April, 1970.

DRUG	Multi-Drug
SAMPLE SIZE	385
SAMPLE TYPE	Addict Deaths
AGE	Not Specified
SEX	Both Male and Female
ETHNICITY	Black, White
GEOGRAPHICAL AREA	United States
METHODOLOGY	Exploratory/Descriptive
DATA COLLECTION INSTRUMENT	Program/Clinic Statistics
DATE(S) CONDUCTED	May 29, 1935 - December 31, 1966
NO. OF REFERENCES	11

SUMMARY

To investigate the question of the effect of chronic opiate abuse on mortality, a retrospective study was performed of all 385 deaths which occurred during hospitalization among 43,215 narcotic addict patients at the Lexington Clinical Research Center, during the period May 29, 1935 to December 31, 1966. It differed from previous research in several ways: (1) the population included addicts from throughout the United States and was not restricted to a single city, state or occupational group; (2) there was no selection by race, sex, or ethnic group, as admissions to the hospital over the past 31 years have reflected the

demographic changes among addicts in general; (3) the sample was older than those of other studies, permitting analysis of causes of death following many years of drug use; (4) acute illness was not the principal reason for hospital admission (the considerable distance to the hospital from the patients' state of residence was of significance in this regard); and (5) the deaths usually occurred following a considerable period of institutionalization, with the result that antemortem clinical records were available.

METHODOLOGY

The cause of death was determined in each case by a detailed review of the clinical course record and, when available, the autopsy findings. An autopsy was performed for 67% of the deaths. The cause of death was determined by 2 of the authors, and a reliability check of this determination was effected. This detailed review of the clinical records, autopsy findings, and collateral data, was undertaken in order to employ a standard and reliable procedure for ascertaining the cause of hospital death. Non-natural deaths were defined as violent deaths (due to suicide, homicide, or traumatic accident) or drug related. There were 25 such non-natural deaths. All other deaths (360) were considered natural, including those related to medical care, which were classified as "iatrogenic." Of these, "surgical deaths" included only those deaths which occurred in the operative, or immediate post-operative, period in which the surgery was elective and in which the death was not related directly to the object of surgery. "Medical deaths" included only deaths due to medical treatment or diagnostic procedures.

FINDINGS

The study classified deaths by pathophysiologic mechanisms and included data on deaths from complications of hepatic disease, number of addict patients admitted to the Lexington Hospital, number who died during hospitalization by period of admission and race, number and rate of male deaths from infections by year of hospital admission, and cause of death for 348 male addict patients at Lexington. One-third of the deaths in this study were due to an infectious process. Of these most were due to tuberculosis and bacterial endocarditis which are recognized concomitants of narcotic addiction. There were only 2 deaths from septicemia, 1 death from tetanus and no deaths from malaria or acute viral hepatitis which are also considered to be diseases of addiction. Over one-fifth died from a circulatory disturbance. Sixty-two percent of these died from cardiac failure. About one-sixth of the deaths were due to a neoplastic process. As the sample was predominantly male, carcinoma of the lung was the most common primary cancer. Forty-four patients died a metabolic death. There were only 10 "iatrogenic" deaths. In the "miscellaneous" group there were 7 deaths from bronchial asthma, of which 4 were due to status asthmaticus. Violent death accounted for only 4.2% of the total. The death of 9 patients was directly attributable to drug abuse.

The study period, 1935-1966, was a time of marked change in the demographic characteristics of narcotic addiction in the United States, as well as one of unprecedented change in the therapeutic modalities available. Mortality and demographic data show an increase of opium addiction among Blacks following World War II, a younger age of Black patients at hospital admission compared with White patients, although this age difference has decreased in recent years, a decline in deaths in recent years, and the consistently earlier age at death of the Black patients, and their lower death rate in all but the last time period studied.

CONCLUSIONS

There is no true "control" data to which the results of this study can be compared. It would be desirable to have age, rate and sex-specific mortality data for all 43,215 former addict patients, but this was not available, nor was it feasible to obtain. Nonetheless, an analysis of hospital deaths within this selected patient population over 30 years did afford a means of observing the relative frequency (or absence) of specific causes of death.

This review of the causes of death among narcotic addicts during hospitalization at the Lexington Clinical Research Center revealed a broader spectrum of disease than is apparent from similar studies originating from medical facilities concerned with acute illness.

Baden, Michael M. Narcotic abuse: A medical examiner's view. New York State Journal of Medicine, 72(7):834-840, April 1, 1972. (13 References)

SUMMARY

An historical overview on the use and abuse of narcotics is presented from the viewpoint of a medical examiner. Epidemiology, acute death, pathology, toxicology, infectious complications, traumatic death, non-narcotic drugs, urine testing, and treatment are discussed. The author concludes that the pathologist has a unique opportunity to contribute to the understanding of many aspects of drug abuse: physical effects of drugs on the body as seen at autopsy; emotional and social factors that predispose to abuse of drugs as determined by interviews with friends, relatives, and police; and evaluation of epidemiologic patterns.

Deaths from heroin abuse are the result of the manner in which the drug is taken: in unknown amounts with unknown diluents and without regard for sterile precautions. An acute fatal reaction following intravenous injection is the major cause of addict death and is commonly inaccurately referred to as "overdose." The precise mechanism of death is not clear in most cases although pharmacologic overdose can sometimes be demonstrated. There are probably many mechanisms for death which may include an allergic-type reaction to heroin, quinine, or other diluents; a reaction to injected bacteria or other foreign materials; or a true pharmacologic overdose of heroin, quinine, or other drugs. There are estimated to be at least 100,000 addicts in New York City who inject 3 or 4 times a day and there are only 3 or 4 deaths daily; acute fatal reaction occurs surprisingly infrequently, approximately every 100,000 injections .

Between 10-20% of addict deaths are due to direct infectious medical complications, particularly hepatitis, infective endocarditis, and tetanus. Subcutaneous users are responsible for almost all deaths from tetanus in New York City. Staphylococcus aureus and gram-negative bacilli are the organisms responsible for most deaths from endocarditis, with about 15% due to fungi. In the majority of cases the aortic or mitral valve is involved with some evidence of prior acquired or congenital cardiac abnormalities.

There is a high incidence of homicidal, suicidal, and accidental death among addicts in addition to deaths directly attributable to heroin injections. Addicts may suffer traumatic death by falling from heights or may be involved in vehicular accidents. In 1970 more than 150 addicts died as a result of homicide: shot by storekeepers, police, or shot or stabbed during arguments among pushers and addicts.

Findings on the relationship between marijuana and death are minimal since neither marijuana nor LSD can presently be detected in body tissues or fluids. Marijuana components can be identified on fingers and teeth. Death does not result directly from "overdose" of marijuana. Autopsies of marijuana smokers who have died of other causes have not demonstrated any pathologic lesions. Cocaine is also difficult to recover toxicologically. There is undoubtedly underreporting of deaths associated with cocaine.

Narcotic abuse was the leading cause of death in New York City in 1968 of persons between the ages of 15 and 35.

Sells, S. B.; Chatham, Lois R.; and Retka, R. L. A study of differential death rates and causes of death among 9,276 opiate addicts during 1970-1971. Contemporary Drug Problems, A Law Quarterly, 1(4):665-706, Fall, 1972.

DRUG	Opiates
SAMPLE SIZE	9,276
SAMPLE TYPE	Treatment (inpatient)
AGE	Cross-Age
SEX	Both Male and Female
ETHNICITY	Cross-Cultural
GEOGRAPHICAL AREA	More than two cities
METHODOLOGY	Case Study
DATA COLLECTION INSTRUMENT	Program/Clinic Statistics
DATE(S) CONDUCTED	1970-1971
NO. OF REFERENCES	46

SUMMARY

The report summarizes previous work on the causes of death among opiate addicts and examines death rates and causes of death among 9,276 opiate addicts in treatment between June 1, 1970 and May 31, 1971. The analysis of death rates was based upon a primary deceased sample of 50 patients who died during the period of study. In addition, causes of death were analyzed in an expanded sample of 80 deceased patients.

The deaths represented by the primary deceased sample of 50 cases approximate a mortality rate of 15 per 1,000 man years in treatment at risk during the period studied. An intensive analysis of sex, race-ethnic, and treatment subgroups of the population at risk revealed a wide range of death rates. These results support the interpretation that deaths among subgroups of this population represent a multi-variate phenomenon. Important controlling factors appear to be related primarily to age and race-ethnic status.

METHODOLOGY

This study involved the analysis of rates and causes of deaths which occurred between June 1, 1970 and May 31, 1971 in a sample of 9,276 opiate addicts in treatment at 23 agencies supported by funds administered by the Narcotic Addict Rehabilitation Branch of the National Institute of Mental Health. The source data were obtained from the files of the Drug Abuse Reporting Program, which involves a computer file of Admission Reports (patient history) and bi-monthly Status Evaluation Reports on drug abuse agencies, supported by N.I.M.H. The addict deaths reported by the 23 participating agencies were differentially grouped in various portions of the study.

The primary deceased sample consisted of 50 patients who died during the 1 year period of the study. This primary deceased sample was used to compute death rates among patients in the base reference sample. An expanded sample of 80 addict deaths included the preceding 50, plus an additional 30 cases that were reported separately by the participating agencies, but were excluded from the base sample after verifying periods of treatment and dates of death in relation to the specific period at risk used to define the base sample. Seventy-four of the 80 patients in this expanded sample were included in the analysis of causes of death; causes of death could not be obtained for the remaining 6 patients.

Patient deaths were reported on a Status Evaluation Report as one category under Current Classification and as a reason for termination.

The questions that the study was designed to answer included: What is the rate of addict deaths for the total base sample? How does it vary by sex, age, race and treatment category? How do these rates compare with others reported in the literature for the United States and Great Britain? What are the causes of death among opiate addicts? What selective factors in causes of death exist in relation to demographic classification, treatment assignment, and individual histories of drug and alcohol abuse, deviance, socioeconomic factors, and health?

FINDINGS

Seventy-four addict deaths were classified as follows:

1. Violent (41%)
2. Drug Abuse related (41%)
3. Other causes (19%)

The proportions over and under 30 (approximately 60 and 40) were the reverse of their representation in the general addict population. Violent deaths accounted for over half (17 of 30) of the under-30 cases, while drug-abuse-related deaths were found for about half (21 of 44) of the over-30 cases. Violence was the predominant cause of death in both the younger groups. Violent deaths also predominated among the Mexican-American deceased sample and this occurred independently of age. Among Blacks, the largest group in the sample, frequency of deaths was very similar to that of the total sample, while the highest frequencies for Whites and Puerto Ricans were in the drug-abuse-related category. The vast majority of the deaths studied were from the large treatment category, methadone maintenance, and they were divided identically as in the total sample with respect to causes of death.

CONCLUSIONS

Two major generalizations can be drawn from the facts presented. First, it is impressive that only a small number of the deaths examined reflected "natural causes," and secondly, that the specfic causes of death cited appear to reflect the life situations of the subjects, which are significantly differentiated by age and ethnic status.

This study enables computation of death rates for a definite and predetermined reference base, which also provides data for computation of differential rates for subcategories of the population at risk. This has important implications for generalizing estimates of the size of the addict population.

Mason, Percy. Mortality among young narcotic addicts. Journal of Mount Sinai Hospital, New York, 34:4-10, January-February, 1967.

DRUG	Opiates
SAMPLE SIZE	2, 743
SAMPLE TYPE	Treatment (inpatient)
AGE	Adolescents (15 to 21 years of age)
SEX	Both Male and Female
ETHNICITY	Black, Puerto Rican, and White
GEOGRAPHICAL AREA	New York City
METHODOLOGY	Exploratory/Descriptive
DATA COLLECTION INSTRUMENT	Observations, Program/Clinic Statistics
DATE(S) CONDUCTED	1952 to 1962
NO. OF REFERENCES	12

SUMMARY

This study of the high mortality rate among narcotic drug addicts discusses the results of an analysis of the 74 deaths occurring among the 2, 743 heroin addicts, aged 15 to 21, who were admitted to Riverside Hospital in New York City between 1952 and 1962. Results showed that over half of the deaths were due to heroin overdose. In 2/3rds of the cases death occurred within one year of discharge from the hospital.

METHODOLOGY

The population of Riverside Hospital consisted of heroin addicts of both sexes, aged 15 to 21 at age of first admission, from socially, economically, and educationally deprived backgrounds. Cause of death was determined when possible for all addicts admitted between July 1952 and October 1962. Only deaths substantiated by Medical Examiner reports or Health Department death certificates were included. Deaths were recorded as they appeared on the documents.

FINDINGS

1. Overdoses

Of the 74 deaths, 66 were males and 8 females. Thirty-nine males and 4 females overdosed; 27 males and 4 females died of other causes.

Breakdown by racial origin of a sample of these patients (1617), showed one-third each White, Negro and Puerto Rican. Negro mortality from overdose (70.8%) was higher than White (52%) or Puerto Rican (48%).

One-third of all addicts used barbiturates in addition to heroin but no deaths due to this drug were recorded, nor to tetanus, malaria, bacterial or mycotic endocarditis. Alcoholism was recorded in only one case; in 5 others it was cited in addition to overdose. Accident was cited in 10 cases. Congestion of viscera was cited in 4, bronchopneumonia in 2; these may have been overdoses overlooked by the authorities.

2. Psychiatric Diagnosis

Two-thirds of the patients had personality disorders, one-fourth had schizophrenia (chronic undifferentiated), and a few were diagnosed as psychoneurotics. A greater percentage of those with schizophrenia died, and these usually of overdose.

3. Time of Death

Of those who died from overdose, 18.6% died within 7 days after discharge, 30.2% in under a month, 48.4% within 3 months, and 69.7% within a year. This appears to indicate high vulnerability at a time when physical condition after detoxification was good but tolerance was lower. Patients had been warned they could not resume their former dosages. Considering the annual death rate among 15 to 21 year olds in New York, observed deaths in the study were about double.

4. Circumstances of Death

Death occurred under varying circumstances: at home, at the hospital after entering for emergency treatment, on rooftops, in hallways. Patients reported that almost every addict had experienced overdose at least once. Emergency "home" treatments were reported: keeping the patient awake, walking and giving a salt shot. There are no statistics on the effectiveness of this treatment compared to hospital treatment. However, death often followed discharge from the hospital after apparently successful emergency treatment.

5. Suicide

Suicide was listed on two death certificates. More may have occurred but were not recognized. Persistent risk-taking by injecting unknown substances must be related to self destructive drives though few patients admit this. Rather, they retain illusions of omnipotence when patently dependent. Observations at Riverside suggested that overdose or suicide may intervene when the well-being following detoxification (enhancing such omnipotence) is dealt a blow by the reality faced once more outside the protection of the hospital.

CONCLUSIONS

Because of the high mortality rate during the immediate discharge post-period, the authors recommend careful observation of addicts after discharge; a more compulsory structuring of the After Care Clinic to improve attendance there; better contact and supervision at the Clinic; and keeping patients who have received emergency treatment for overdose under hospital observation for 24 hours after regaining consciousness.

Cherubin, Charles, et al. The epidemiology of death in narcotic addicts. American Journal of Epidemiology, 96(1):11-22, 1972.

DRUG	Opiates
SAMPLE SIZE	591
SAMPLE TYPE	Addicts
AGE	15-66; mean age, 28.3
SEX	85 percent Male; 15 percent Female
ETHNICITY	52 percent Black; 24 percent Puerto Rican; 22 percent White; 2 percent Other
GEOGRAPHICAL AREA	New York City, New York
METHODOLOGY	Statistical Survey
DATA COLLECTION INSTRUMENT	Laboratory/Examination Program/Clinic Statistics
DATE(S) CONDUCTED	1967
NO. OF REFERENCES	26

SUMMARY

Information obtained from the Office of the Chief Medical Examiner of New York City and the Narcotics Register of the New York City Department of Health was used to examine the epidemiology of deaths in narcotic addicts. There was a notable increase in these deaths from 1967 through 1970, in parallel with other evidence of a marked expansion of the addict population. During the period from 1964-1966, the number of deaths had been stable, as were other indices of the addict population. When deaths during 1967 were examined, 80% were found to be assigned the diagnosis of "narcotism." In nearly 90% of these mortalities there was a recent intravenous injection with apparent sudden collapse, and evidence of pulmonary edema was frequently noted. It is probable that there is an "acute reaction" to injected material.

There was a marked seasonal variation in narcotism deaths, with a peak in the summer months, not occurring in other causes of death. A summer peak was also noted for hepatitis in addicts, hospitalizations for cellulitis, and nonfatal "overdoses." In the second half of the year total reports of addicts are higher.

The demographic characteristics of the narcotism deaths were similar to those of the total addict population known to the Narcotics Register. It was suggested that there is no especially high risk group among addicts for this cause of death. In contrast, deaths due to infection and trauma were more prevalent among older addicts.

METHODOLOGY

The first part of the study, an examination of the epidemiology of deaths associated with narcotic abuse in New York City, was derived mainly from data available from the Narcotics Register of the New York City Health Department. Information was also obtained from reports and communications from the Office of the Chief Medical Examiner.

The second part of the study was based on 591 deaths in 1967 considered by the Office of the Chief Medical Examiner to have occurred in persons who had used narcotics. A death certificate was obtained in all cases and toxicology reports in 588 (99.5 percent). Autopsy reports were available for 390 (66 percent). In the remaining cases no autopsy report was available (34 percent). Demographic (age, sex, ethnic group, and residence), pathologic and toxicologic data and circumstances of death were abstracted from records, coded, and punched onto IBM cards for data processing.

FINDINGS

The annual number of deaths in New York City arising from narcotics use increased markedly from 1950 to 1970. After a relatively stable period, 1961-1966, the marked increase from 1967-1970 was paralleled by a large increase in reports of addicts to the Narcotics Register. From 1964 to 1968 the mortality rate remained fairly constant with a mean of about 7 per 1,000 per year with a slightly lower rate for persons under 30.

Between 1964 and 1969 the age distribution of deaths changed: the percentage of deaths which occurred in the under-25 age group approximately doubled; in 1969 the majority of deaths were in this age group.

In the 591 deaths, 85 percent were male and 15 percent were female. The ages ranged from 15 to 66 with a mean of 28.3 years. Male age distribution peaked in the 20-24 year age group; females showed a plateau from 20-39 years. Half of the deaths (52 percent) were of Black addicts, 24 percent Puerto Ricans, 22 percent Whites, and 2 percent of unknown ethnic origin. There was a significant clustering of deaths in certain Health Districts, most notably Central Harlem, which alone accounted for almost 20 percent of all deaths. The

mortality rates calculated for each Health District were in a similar range of about 6 to 9 per 1,000.

Deaths showed a marked seasonal variation. Monthly distribution of deaths for the period 1964 through 1968 showed definite increases in summer and fall. Reports of nonfatal "overdose" and of hepatitis, abscesses and cellulitis cases admitted to Harlem Hospital showed a similar trend.

Death certificates listed a total of 697 diagnoses for the 591 deaths. These diagnoses were grouped; the most numerous category consisted of patients with the primary diagnosis of "acute" or "acute and chronic" or just "chronic narcotism." While death due to infections and other miscellaneous medical causes was more frequent in older addicts, the characteristics of "narcotism" and trauma deaths closely resembled that of the total Register population of known addicts. One exception was noted in the "narcotism" category which contained slightly more males, more Blacks, and more Manhattan dwellers who were perhaps slightly older.

Autopsies were performed by 20 different prosecutors. The presence of an injection site showed no great variability and was considered a reliably recorded finding. The presence of pulmonary congestion and edema showed greater variability, and perivenous scarring and bronchial froth showed considerable variation. A recent injection site was found in 75 percent of autopsies. Pulmonary congestion, edema and bronchial froth were seen in 75 percent, 66 percent and 43 percent of all autopsied cases, respectively. Fatty infiltration of the liver was noted in 24 percent of the 381 autopsies. Cirrhosis was diagnosed in 18 cases.

Toxicology reports were available for 99 percent of the cases. Of the cases tested for narcotics and quinine, 51 percent were positive for narcotics and 19 percent for quinine. Of the 549 cases tested for alcohol, 43 percent were positive. Forty-seven percent of the "acute narcotism" group had detectable alcohol levels at the time of death.

CONCLUSIONS

The character of the reported addict population had gradually changed between 1950 and 1970: the newly reported addict was younger than in previous years and there had been a gradual shift to other boroughs of New York from Manhattan.

It was suggested that deaths due to "narcotism" were epidemiologic random phenomena; that there is no defined group which was an especially high risk. A higher mortality rate in older addicts was attributed to the frequency of infectious disease and miscellaneous medical causes of death increasing with age. Increase in the number of deaths appeared to be strongly tied to the presumed increase in addict population. Seasonal variation seemed to parallel a seasonal variation in reports of hospitalized addicts with "overdose," hepatitis, and cutaneous infections.

Causes of death in institutionalized addicts were chronic diseases: heart disease, neoplasia tuberculosis, and cerebrovascular disease. Infections such as tetanus, hepatitis, endocarditis, pneumonia, and other septic complications contributed significantly to mortality. The epidemiologic and pathologic findings strongly supported the contention that a syndrome of fatal acute reactions exists. The authors concluded that the main cause of death in New York narcotic addicts was an idiosyncratic reaction to an intravenous infection of unspecified material and probably not a true pharmacologic overdose of narcotics. The high proportion of deaths which had detectable alcohol levels suggested that alcohol might also have a role in the "narcotism" deaths.

Helpern, Milton. Deaths resulting from narcotic addiction -- A major health problem. In: Keup, Wolfram, ed. Drug Abuse: Current Concepts and Research. Springfield, Illinois: Charles C. Thomas, 1972, pp. 51-63.

DRUG	Multi-Drug
SAMPLE SIZE	Not Specified
SAMPLE TYPE	Narcotic Deaths
AGE	Cross-Age
SEX	Both Male and Female
ETHNICITY	Black and White
GEOGRAPHICAL AREA	New York City
METHODOLOGY	Exploratory/Descriptive
DATA COLLECTION INSTRUMENT	Laboratory/Examination and Government Statistics
DATE(S) CONDUCTED	1950 - Spring, 1970
NO. OF REFERENCES	9

SUMMARY

This report discussed the evolution of narcotic addiction as it is encountered in New York City, giving history and background information based on 37 years of experience in officially investigating the circumstances and determining the cause of all deaths of addicts occurring during that period of time, and reviewing statistical findings, geographical distribution and place of deaths and details of pathological and external findings.

Prior to 1943, there were relatively few deaths of addicts from overdosage. The use in common of narcotics, and the indiscriminate sharing of unsterilized improvised syringes for intravenous injection of drugs, were the basis for a substantial epidemic of estivo-autumnal malaria among the addict population of New York and other urban centers in the 1930's. In addition to fatalities from malaria, there were occasional deaths caused by sepsis from large subcutaneous abscesses, or by bacterial endocarditis secondary to infected needle punctures in the skin, septic thrombophlebitis in injected veins and tetanus in subcutaneous addicts.

During World War II, heroin was practically unobtainable in the United States. Some addicts continued their addiction with the use of substitutes, such as amphetamines and various barbiturates, and there were some fatalities among these from septic infection originating in the injection sites, but the number was small. At the end of the war, organized illegal traffic in heroin was resumed, and with this renewed supply came an alarming increase in narcotic addiction. An important indicator is provided by the official investigation and determination of fatalities directly caused by addiction, and by evidence of addiction in persons dying of other causes, in which cases the addiction can reasonably be considered an important circumstance. There has been a steady increase in such fatalities during the last 20 years, especially in acute deaths directly caused by narcotism, with the incidence greatest during the last 3 years. The increasing incidence and total number of deaths due to addiction provide an important indicator of the extent of the problem, which is the greatest single cause of death of adolescents and young adults from 15 to 35.

METHODOLOGY

Statistics summarized in this report came from the official records of addict deaths in New York City from 1950 through June of 1970. Pathological and external findings were based on the observation of the author. The diagnosis of acute narcotism or of direct complications of narcotic addiction as a cause of death is determined by an investigation of the circumstances of the death, the gross and microscopic pathologic findings of a complete autopsy, and toxicologic study.

FINDINGS

Statistical Findings

The increase in the total number, as well as percentage, of deaths from narcotic addiction became abrupt in 1959, and is still continuing. The incidence of deaths in 1960 was 215. A striking increase of 311 deaths was noted in 1961. The incidence for 1962-1964 remained high.

The total number of deaths from narcotism from 1950 through 1959 was 1,076. Approximately 1,400 additional fatalities were encountered in the next 5-year period, making a total of about 2,500 deaths during the 15-year period from 1950 through 1964; approximately 1,400, or 3/5ths of all the deaths occurred during the last 5 years of the 15-year period studied. During the next 9-year period from 1960 through 1968, there were 3,354 deaths. In 1969 there were more than 900 additional deaths, making the total for the last decade about 4,300, or more than 4 times the incidence of the decade of 1950-1959.

The ratio of deaths from narcotism in Blacks, as compared with Whites, is about 12 to 1. The ratio of deaths in male Blacks compared with White males is 10 to 1; the female ratio, Black to White, is greater: almost 15 to 1.

During the first 10 years (1950-1959), about 10% of all deaths caused by narcotism occurred in adolescents. Approximately 25% of the deaths were in individuals under 25 years of age. About 60% of the deaths occurred below the age of 30 years, about 75% before the age of 35 years, and more than 90% of all narcotic deaths before the age of 50 years. Narcotic addiction, and the fatalities arising therefrom, are encountered predominantly in the younger age groups (from 15 to 39) who use heroin. During the decade 1950-1959, 110 of the 1,076 (about 10%) deaths occurred in adolescents or teenagers from 15 to 19 years of age. In the decade from 1960-1969, 536 of the approximately 4,300 fatalities from addiction occurred in this adolescent group, an incidence of 12%. For the first 6 months of 1970 there were 389 deaths from heroin addiction; of these, 89 occurred in adolescents (14 to 19 years) and 300 between the ages of 20 and 40.

The highest percentage of addiction deaths and presumably of total addiction occurred in the unskilled worker or laborer group, with a lower incidence in the semiskilled and skilled worker groups.

Geographic Distribution

In New York City the greatest number of narcotic deaths occurred in the Borough of Manhattan. Approximately 75% of all such deaths in New York City formerly took place in this borough; in recent years, the incidence of fatalities has increased in all the boroughs. This relatively lower incidence of narcotic deaths in jurisdictions outside of New York City is subject to question, in the opinion of the writer: Some narcotic deaths may have been unreported or have gone unrecognized.

Place of Death

The character of the premises in which the narcotic addict is found dead is very significant, and is a useful circumstance for arousing suspicion on the part of the medical investigator that he is being confronted with a narcotic death even in the absence of more positive evidence. The body or the injection equipment may have been moved from the place of death. Many cases initially are unlabeled or incorrectly labeled, and it is easy for an inexperienced pathologist to fail to recognize the cause of death at autopsy.

Pathologic Findings and Causes of Death

The largest number of deaths resulted from "acute reactions," and in the compilation for the 12-year period from 1950 through 1961 the percentage of these cases was 48. In the recent years of this study, with a considerably higher death rate from addiction, the "acute reaction" deaths greatly exceeded the incidence of such acute deaths in the earlier years, and of other less rapid fatal complications of narcotic addiction. The same dose taken in the same way may be unpredictably fatal. Moreover, there does not appear to be a quantitative correlation between the acute fulminating lethal effect and the amount of heroin taken, as there is with overdosage of morphine and other alkaloids.

External Findings

In the acute fatal reactions to the intravenous injections of crude mixtures of heroin and other substances, examination of the body in most cases reveals very suggestive, almost characteristic, appearances. It is not uncommon to find an abundance of partly dried frothy white edema fluid oozing from the nostrils or mouth, indicative of severe pulmonary edema. The skin over the superficial veins of the elbow folds (antecubital fossae), and adjacent portions of the forearms may reveal one or two fresh needle punctures which are not always conspicuous. The injection sites are usually not difficult to discern and are readily confirmed by incision of the skin. Careful scrutiny is sometimes needed because the needle puncture may be located in other areas and may be difficult to find, especially in addicts who do not have the usual characteristic row of closely placed pigmented needle-puncture scars in the skin overlying the veins used for intravenous injection of heroin. In recently addicted persons, or in more fastidious individuals, the skin over the veins may not be conspicuously scarred, and careful scrutiny including incision is required to detect the fresh injection sites. The subcutaneous injection of narcotics, encountered more often in women and older addicts, may be done through the clothing into the skin of the shoulders,

thighs, arms, abdomen and sides of the chest. Formation of numerous conspicuous, characteristic, round and oval or irregularly shaped, unevenly pigmented depressed skin scars may be the result of abscesses. Fatal sepsis may complicate the abscesses. In some cases repeated subcutaneous injections merely produce a diffuse uneven induration of the skin and subcutaneous tissue, especially in the thighs or arms, without abscess formation or skin scars, evident only on palpation. Subcutaneous injections may also introduce tetanus organisms and give rise to fatal tetanus infection with characteristic symptoms, especially in women addicts, and death is more likely to occur after hospitalization for convulsive seizures and trismus.

CONCLUSIONS

Narcotic addiction, particularly among young people, is a major health problem in New York City as in other urban centers, with an increasing incidence and total number of deaths due to addiction. For the diagnosis of acute narcotism or of direct complications of narcotic addiction as a cause of death, the investigator must be extremely alert to significant details which at first may not be obvious.

Helpern, Milton, and Rho, Yong-Myun. Deaths from narcotism in New York City. Incidence, circumstances, and postmortem findings. New York State Journal of Medicine. 66(18):2391-2408, September 15, 1966.

DRUG	Heroin
SAMPLE SIZE	Not Specified
SAMPLE TYPE	Known Addicts
AGE	Cross-Age
SEX	Both Male and Female
ETHNICITY	Cross-Cultural
GEOGRAPHICAL AREA	New York City
METHODOLOGY	Statistical Survey
DATA COLLECTION INSTRUMENT	Observations, Laboratory/Examination, Program/Clinic Statistics
DATE(S) CONDUCTED	1930-1961
NO. OF REFERENCES	9

SUMMARY

The incidence, circumstances, and postmortem findings are reported from over 30 years of experience investigating deaths from narcotism in New York City.

METHODOLOGY

A statistical evaluation of deaths from narcotism for the period 1950 through 1964 was conducted with more detailed analysis of data for the ten-year period through 1959. The data were grouped into categories of yearly incidence, monthly incidence, racial and sex

incidence, age distribution, marital status, occupation, geographic distribution by borough and district, character of premises in which the body was found, and causes of death. Gross and microscopic pathologic findings of autopsies in the cases investigated are reported with emphasis on the external evidences of narcotism and the almost characteristic appearance of the lungs, indicating acute rapid death encountered in intravenous narcotism.

FINDINGS

Analysis of official investigations of deaths in New York City over the past 30 years has shown increased addiction to narcotic drugs, especially heroin, since World War II. It was found that since quinine was added as a diluent of heroin (since 1943), there have been no cases of artificially transmitted malaria. In the 10-year period between 1930 to 1943, 136 fatalities from estivo-autumnal malaria were autopsied. At this time an intensive epidemiological study was made which revealed many live infected contacts among the addicted population and resulted in prompt treatment for dangerously ill patients who would have otherwise died. Since the increase in the availability of heroin, it was discovered that intravenous use increased with a corresponding increase in other crimes to support this expensive habit.

The statistical study of deaths from 1950 to 1964 revealed:

(1) An increase from year to year in number and percentage of deaths was seen becoming most abrupt in 1959 with a sex ratio of 4 males to 1 female during that year.

(2) The greatest incidence among males occurred in May and in August among women.

(3) The ratio of deaths from narcotism in Blacks as compared with Whites was 12 to 1.

(4) Narcotic fatalities were predominantly from younger age groups, comprising the so-called "street addicts" who use heroin in contrast to other "medical addicts" who become addicted to morphine and meperidine hydrochloride (Demerol).

(5) Average age over a 12-year span was 29 years in men and 30 years in women.

(6) Over 50% of narcotism deaths occurred in single people.

(7) The incidence of addiction deaths appears to be inversely proportional to the intelligence involved in occupations held, with unskilled workers providing the hignest percentage of addicts and deaths from addiction.

Pathologic findings, causes of deaths, external and autopsy findings revealed the following:

(1) Acute reaction to dosage accounted for 48% of the narcotic addiction deaths for the period 1950 to 1961. Overdosage, other diluents contained in street samples, and heroin tolerance were discussed as causes of the acute reaction. There did not appear to be a quantitative correlation between the acute fulminating lethal effect and the amount of heroin taken, as there has been with overdosage of morphine and other alkaloids.

(2) Indications of severe pulmonary edema were often found.

(3) No more effect on the involved vein was sometimes found than a chronic fibrous thickening of its wall and induration of overlying skin.

(4) Subcutaneous injections may also introduce spores of Clostridium tetani and give rise to fatal tetanus infection with characteristic symptoms.

(5) In acute deaths there was a generalized congestion of organs and in the intravenous addict both lungs were unusually enlarged, heavy, stiff, and did not collapse when removed from the chest.

(6) An aspirated material was found in the lungs; this was sometimes milk which some addicts mistakenly believed would be a restorative antidote for reviving addicts who collapse after an intravenous injection of a narcotic.

(7) Active narcotism was found in association with rapidly progressive pulmonary tuberculosis.

CONCLUSIONS

External findings, as well as correct interpretation of autopsy findings were found to be important in diagnosis of acute fatal reactions. Careless inquiry or examination of the body could result in misinterpretation of the findings and failure to associate death with narcotic addiction even when an autopsy is performed.

Helpern, Milton. Fatalities from narcotic addiction in New York City: Incidence, circumstances, and pathologic findings. Human Pathology, 3(1): 13-21, March 1972.

DRUG	Heroin
SAMPLE SIZE	Not Specified
SAMPLE TYPE	Known Addicts
AGE	Cross-Age
SEX	Both Male and Female
ETHNICITY	Cross-Cultural
GEOGRAPHICAL AREA	New York City
METHODOLOGY	Statistical Survey
DATA COLLECTION INSTRUMENT	Observations, Laboratory/Examination, Program/Clinic Statistics
DATE(S) CONDUCTED	1930 to 1971
NO. OF REFERENCES	3

SUMMARY

The material forming the basis for this paper was presented at the 50th annual meeting of the German Society of Legal Medicine, Cologne, in 1971. Some of the findings also appeared in an earlier paper by Helpern and Rho in 1966, (New York Journal of Medicine, 66:2391-2408). Additional data on age, sex, geographic distribution, place of death, pathologic findings and external findings for deaths of narcotic addicts were presented.

METHODOLOGY

Diagnosis of acute narcotism or direct complications causing death was based on circumstances of death, gross and microscopic pathologic findings of complete autopsy and toxicologic study. The author's findings were based on his 40-year experience as Chief Medical Examiner of New York City.

FINDINGS

Since 1943 there have been no reported fatalities from artificially transmitted cases of malaria in New York City among intravenous addicts. A small outbreak of vivax malaria was reported in 1971 in Bakersfield, California among addicts who were infected by addicted soldiers returning from Vietnam with malaria that they had acquired naturally. It was found at the time of this study: (1) with a resident New York City population of 8,000,000, there were about 100,000 persons addicted to "hard" drugs of which heroin was the most abundant; (2) the predominance of males continued with a ratio of 6 to 1; and (3) deaths occurred throughout the year with uneven frequency. A definite decrease occurred in the average mean age of persons whose deaths resulted from narcotics over the 20-year period from 1950 through 1969. In 1969 the average mean age was 25 years. An increase from 48% in 1950-1961 to 80% in 1970 of deaths from acute reaction to narcotics was reported.

In 1969 it was found that 20% of those who died from narcotic addiction were unemployed; for 28% the occupation was unknown, in contrast to the 44% of semi and low skilled laborers. Subcutaneous injection of narcotics was found to be more common in women; this frequently resulted in sepsis and could introduce fatal tetanus infection. A possible reason suggested for less frequent tetanus infection in working class men was immunization as part of a prophylactic program designed to combat this disease.

CONCLUSION

It was concluded by this author and his associates that a diagnosis of an acute death from narcotic addiction was more reliably derived from an investigation of the circumstances under which the body was found and from findings of a complete postmortem examination than from toxicologic analysis.

Larrier, D.; Cline, M; Brophy, F.; et al. Deaths among narcotic abusers in New York City, January-June, 1970. Contemporary Drug Problems, A Law Quarterly, 4(4):711-725, Fall, 1972.

DRUG	Multi-Drug
SAMPLE SIZE	574
SAMPLE TYPE	Drug Deaths
AGE	Cross-Age
SEX	Both Male and Female
ETHNICITY	56% Black, 15% Puerto Rican, 29% White
GEOGRAPHICAL AREA	New York City
METHODOLOGY	Statistical Survey - Cross Section
DATA COLLECTION INSTRUMENT	Bureau
DATE(S) CONDUCTED	January to June 1970
NO. OF REFERENCES	2

SUMMARY

This study compared the number and characteristics of narcotic abusers who died in New York City during the first 6 months of 1970 to all the deaths from narcotics known to the New York City Narcotics Register at the end of 1969. The composition of both groups was the same by age, sex and ethnicity.

The primary cause of death among the population that was sampled was acute and chronic intravenous narcotism (overdose). This proved to be true for all ages, ethnic groups, and for both sexes. Although true for all age groups, it was particularly marked in

the youngest groups, where 8 out of 10 deaths were due to this cause. Other types of deaths included accident, homicide, drug-related diseases, and non-drug-related diseases.

This report specifically attempted to do 3 things: to provide a description of the sociodemographic characteristics of cases of death among narcotic abusers during the first 6 months of 1970; to give a comparison of this death cohort with the total file of narcotic abusers to demonstrate the nonuniqueness of the cohort; and to give a comparison of subcohorts among the deaths, of those previously "known", with the total Register population.

The overall attempt was to compare the narcotic abuse cases which were brought to official attention by the reporting network of the Register with those cases which came to the attention of the Register only through the phenomenon of death.

METHODOLOGY

Notification of narcotic abusers who died during the first 6 months of 1970 was obtained from several sources.

A. The Narcotics Register routinely obtains copies of death certificates from the Bureau of Vital Statistics, New York City Department of Health, for cases in which a notation of narcotic addiction was made anywhere on the certificate. For these cases the cause of death is generally given by the Office of the Chief Medical Examiner of New York City.

B. Where causes of death are "pending" on the certificate, and the Medical Examiner later finds drug traces through chemical examination, the names are recorded and recovered from the Bureau of Vital Statistics. To find cases of the presence of drugs where death was by other means the Medical Examiner's toxicology reports are searched.

C. The Methadone Maintenance Treatment Program of Rockefeller University directly notifies the Register of deaths among patients in the program.

D. Some private, voluntary and municipal hospitals directly notify the Register of deaths among narcotic abusers.

In many cases only the name of the individual was given to the Register. In these cases the Register contacted the registrar's office of one of the 5 boroughs and obtained the necessary information from the death certificate.

FINDINGS

The statistics show that 29% of the decedents were White, 56% Black, and 15% were Puerto Rican. There were 117 deaths (21%) under age 19; 152 (26%) between 20 and 24; 114 (20%) age 25 to 29; and 191 (33%) age 30 and over. Eighty-two percent were men, and 18% were women. There was no significant difference when these statistics were compared to the total Register population.

The remaining deaths were due to homicide, 80 (19%); accident, 25 (5%); drug-related diseases, 30 (5%); and non-drug-related diseases, 53 (9%).

The proportion of people dying from acute and chronic intravenous narcotism (A.C.I.N.) was: 79% of Whites, 62% of Blacks, and 69% of Puerto Ricans. Nineteen percent of Blacks died from homicide, compared to 6% of Whites and 9% of Puerto Ricans. Deaths attributed to A.C.I.N. comprised 78% of those 15 to 19, 53% of those 35 to 39, and 60% of those 40 and over.

In comparing the deaths reported in the first 6 months of 1970 with those previously known to the Register, no significant differences were found.

CONCLUSIONS

It was noted that present statistics are incomplete, since many agencies have not reported drug abusers to the Register, for a variety of reasons. The author suggests that these findings will make possible a methodology for estimating prevalence of drug abuse. Since it appears that the distribution of sex, age, ethnic group, and other characteristics of deaths among addicts continues to be a good approximation of those of the Register population characteristics, the relationships of known to unknown deaths can be used as a model for estimating the number of unreported cases in New York City, and for refining overall prevalence estimates.

IV. OPIATE RELATED DEATH: INFECTIOUS DISEASE

Bewley, Thomas H.; Ben-Arie, Oved; and Marks, Vincent. Morbidity and mortality from heroin dependence. 3: Relation of hepatitis to self-injection techniques. British Medical Journal, 1:730-732, March 23, 1968.

DRUG	Heroin
SAMPLE SIZE	121
SAMPLE TYPE	Treatment (inpatient)
AGE	Not Specified
SEX	Not Specified
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	London, England
METHODOLOGY	Exploratory/Descriptive
DATA COLLECTION INSTRUMENT	Questionnaires
DATE(S) CONDUCTED	1966
NO. OF REFERENCES	9

SUMMARY

The authors noted a high incidence of complications in heroin addicts treated at Tooting Bec Hospital, London. Hepatitis with jaundice, impaired liver function, and septic complications due to self-injection were common. Further information about such occurrence was sought. A total of 121 cases of hepatitis were traced. In addition, routine liver function tests performed on 284 addicts admitted to hospitals served by the Area Laboratory, West Park Hospital, were analyzed, and fifty addicts were questioned about their techniques of self-injection.

The hepatitis epidemic in the Notting Hill area of London in 1966 was believed to be caused by widespread sharing of syringes and needles (only 3 of 51 addicts with hepatitis denied sharing, compared with 13 of 45 other addicts questioned). Most of the cases were mild. Extensive liver function tests showed that 60% of the individuals had evidence of hepatocellular damage. Of the 50 addicts questioned concerning self-injection, none regularly used aseptic techniques and many had unclean injection habits.

The authors concluded that the education of addicts may improve injection techniques, but so far it has not been successful. They feel it essential that doctors in charge of treatment centers be aware of how their patients inject themselves. An effort to instill principles of asepsis should be made and if this fails, prepared solutions of drug in single-dose non-reusable containers might be prescribed when it is necessary for intravenous drugs to be dispensed.

METHODOLOGY

Cases of heroin addicts with hepatitis and jaundice were reviewed from reports of relevant hospitals and general practitioners who treated the cases. Cases were divided into two groups: "definite," when clinical and biochemical confirmation of hepatitis was available, or where a reliable history was obtained; and "probable," if information available was suggestive but not sufficient to satisfy all the above criteria, or where there was a definite history of jaundice in an associate.

Conventional liver function tests were carried out on 30 jaundiced and 254 non-jaundiced heroin and cocaine addicts treated at hospitals served by Area Laboratory. Serum bilirubin, aspartate aminotransferase (S.G.P.T.), alkaline phosphatase and serum electrophoretic patterns were measured in every patient. Each case was ascribed to one of four categories: severe liver damage, moderate liver damage, mild liver damage, and no definite evidence of liver disease.

Fifty heroin addicts were given a standard questionnaire about their methods of self-injection, concerning the type of syringe and needle used, how they were carried, whether instruments were boiled or cleaned before use, and about any aseptic precautions taken.

FINDINGS

In 94 cases where addicts developed hepatitis, the exact date of onset was known. There appeared to be a small epidemic from March to June, 1966, and a number of addicts had knowledge of

this occurrence in the Notting Hill area of London. The addicts said it was started by a group who shared needles. Of 57 addicts with hepatitis only 3 denied ever sharing, compared with 13 out of 14 addicts without hepatitis.

Results of the liver function tests showed 17.5% of the addicts (50) had severe liver damage, while 13.7% (39) had moderate liver damage, 28.9% (82) showed mild liver damage and 39.8% (113) were classed as "normal." These addicts were also compared with tests from oral amphetamine and barbiturate addicts.

As for techniques of self-injection, the authors found that 11 out of 50 patients carried syringes loose in their pockets or wrapped in tissue paper. Some carried equipment in special tins, and disposable syringes were often carried in polyethylene wraps. Needles were carried loose inside various containers and in 3 cases, behind the lapel of a coat. Twenty-seven patients dissolved heroin in cold tap water while 18 regularly carried water in bottles for up to 2 days. Fifteen had at some time dissolved heroin by shaking, and only 6 dissolved it regularly by "cooking" or boiling.

Thirty-three patients used disposable syringes regularly, but none used them only once. Thirteen used them until stiff or stuck, and the rest from 1 day to 1 week, from twice to 6 times daily. Other pieces of equipment used were modified eye-droppers and glass syringes. Thirty patients used disposable needles, but none used these only once. When blocked or blunt, 11 would discard needles, and 19 used all-steel needles for periods of 1 day to 1 week. Only 1 individual used a new needle each time. Some sharpened needles on a kitchen sink or steps.

To clean, 23 patients flushed syringes in cold water, 7 in hot water, and 5 with antiseptic solution. Four rarely or never cleaned their equipment. Equipment was flushed before use only if noticeably dirty or if blood clots were present. No addict regularly boiled equipment between injections, and the 31 using disposable equipment never boiled either non-disposable syringes or needles. Ten boiled them at some time.

Fifteen patients never cleaned their skins at all. Feeling needles with fingers and lips, blowing through needles when blocked, injecting through clothing, placing equipment on a floor (often in toilets) were all mentioned by addicts. Six licked blood off their skin after injection. When addicts were asked to assess their cleanliness, many considered themselves careful.

CONCLUSIONS

The authors conclude that the recent increase of hepatitis in heroin addicts in Britain is partially accounted for by the overall increase in number of addicts. However, the occurrence of an epidemic in the "shared needle group" was thought to demonstrate that sharing facilitates the spread of viral hepatitis.

Liver function tests showed a higher incidence of hepatic dysfunction than in previous reports from the United States. Causes of liver damage are enumerated. However, the authors add that experimental evidence suggests pure heroin alone does not cause liver damage.

Asepsis was minimal, and injection behavior of London addicts was similar to that of street addicts obtaining illegal heroin in New York. Thus, it was felt that obtaining equipment and heroin from a legal source did not lead to any improvement in injection methods. The authors suggest that though they realize the dangers, many addicts continue with their septic techniques.

Deterioration in standards of sterility after the introduction of disposable syringes, lack of concern, rituals associated with addiction, sharing equipment, and poor social circumstances contribute to the problem. The necessity for doctors' awareness of injection techniques is stressed, as well as a determined effort to instill principles of asepsis. Failing this, when it is necessary to inject intravenous drugs, prepared solutions of the drug in single-dose non-reusable containers might be prescribed.

Cherubin, Charles E. Clinical severity of tetanus in narcotic addicts in New York City. Archives of Internal Medicine, 121:156-158, February, 1968.

DRUG	Opiates
SAMPLE SIZE	42
SAMPLE TYPE	Treatment (inpatient)
AGE	Adults
SEX	Both Male and Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	New York City
METHODOLOGY	Case Studies
DATA COLLECTION INSTRUMENT	Laboratory/Examination Program/Clinic Statistics
DATE(S) CONDUCTED	1967
NO. OF REFERENCES	9

SUMMARY

Since 1955 the majority of tetanus cases in New York have occurred in addicts. This study described the unique clinical features of a new form of "urban" or addict tetanus characterized by a high frequency of Negro women, relatively young patients, and a strikingly high mortality rate, all of which contrast with the usual picture of tetanus. In particular, the study summarized experience with 42 cases of tetanus at Metropolitan Hospital, New York.

METHODOLOGY

Clinical material for the study was gathered at the Metropolitan Hospital between 1955 and July 1967. During this period, 38 cases were treated in narcotic addicts and 4 in nonaddicts. During the same period, 114 cases of tetanus were reported in New York City to the Bureau of Preventable Diseases. Three-quarters of these cases (89 of the 114) were addicts.

Two-thirds of the addict patients seen at Metropolitan Hospital between 1955 and 1967 were women and nearly all of these were Negro women, while the nonaddict patients were all men. (Since 1965, one-half of the addict cases admitted to this hospital have been men.) The mean age of the addicts was 31 years as compared with 45 years for nonaddicts.

FINDINGS

In nearly every addict case, abscesses or subcutaneous indurations or nodules were described. Twenty of the 30 cases at the Metropolitan Hospital in which this information was noted used the subcutaneous route of injection ("skin-popping") primarily; 5 were intravenous ("mainlining") users; and 5 used both methods. All 25 who used the subcutaneous route only, or in part, had multiple chronic abscesses on the thighs and occasionally over the deltoids. Fluctuant abscesses were found, however, in only 7. Four of the 5 cases who used "mainlining" entirely had an evident cellulitis or abscess on admission.

The first symptom of the majority of tetanus patients was stiffness or pain in the neck or back; trismus was usually noted several hours afterward. The interval between the onset of symptoms and hospital admission was very short for the addicts; the disease developed with great rapidity. All addict cases had generalized tetanospasm within 3 days after admission. A majority had tetanospasm and opisthotonos within 24 hours. Two-thirds of the deaths occurred within the first 4 days after admission. A comparison between addict and nonaddict tetanus cases for New York City as a whole showed a significantly shorter hospital stay prior to death for addicts, with nonaddicts dying after a prolonged hospitalization. This was also noted at Metropolitan Hospital although the number of nonaddict cases was small. The fatality rate at Metropolitan Hospital was 87% for addicts and 38% for nonaddicts. It has been theorized that puncture wounds - a characteristic that all addict cases share -- are more favorable to toxin production and absorption than other types of wounds.

In the patients in this series, a respiratory death due to retained secretions or inadequate ventilatory assistance was strongly suggested. Death was usually sudden and when observed, it was preceded by convulsions and apnea. Respiratory impairment was uniformly implicated, either due to obstruction of the airways, spasm or fatigue of the respiratory muscles, inadequate mechanical respiratory assistance systems, or a diffuse pneumonia. The time of death was late evening or early morning in 80% of the deaths, when the patients were clearly unattended. The author suggests that it is not a particular agent or dosage schedule which is of paramount importance but rather the meticulous nursing care, especially tracheotomy care and bronchial toilet, which make for therapeutic success.

CONCLUSIONS

These patients should be treated in an intensive care unit with continuity of medical and nursing personnel. Severe tetanus requires a surgical plane of anesthesia or curarization and, therefore, tracheotomy , continuous mechanical respiratory assistance, blood gas and ventilatory analysis , intravenous fluid, and continuous nursing for periods of at least two weeks. Until adequate immunization programs are created for addicts, there is a clear need to improve the methods of treating these patients. Tetanus is a relatively uncommon disease, but a unique epidemiologic situation in upper Manhattan has increased the incidence of severe tetanus to the point that it has become a significant diagnostic and therapeutic problem.

Cherubin, Charles E. The medical sequelae of narcotic addiction. Annals of Internal Medicine, 67(1):23-33, July, 1967. (74 references).

SUMMARY

This report pointed out that the clinical diseases of drug addicts receive relatively scant attention, although a body of information which is not extensive or entirely satisfactory does exist on just this aspect of addiction. This report was intended both as a survey of the material to be found in the literature and as a summary of some of the unpublished data available on the subject which is relevant to narcotic addiction as it exists in New York City. It discussed studies giving evidence of increased mortality in addicts and information available on addiction demography (the addict population, primarily composed of young adult males, is about half Negro from certain deteriorated neighborhoods in Manhattan, the Bronx and Brooklyn) and reviewed the disease states associated with addiction to narcotics and the findings reported in existing literature.

The principal cause of death appeared to be sudden collapse with pulmonary edema after intravenous injection. Other conditions associated with narcotic usage were tetanus, septicemia, tuberculosis, hepatitis, an unknown type of chronic liver disease, endocarditis, skin abscesses, thrombophlebitis, pulmonary embolism, pulmonary hypertension due to foreign body granuloma, and complications of pregnancy. No longer seen is the malaria that was at one time the most widely recognized addiction-associated disease state.

This review of infectious diseases and other conditions associated with a known addiction to narcotics was undertaken to identify gaps in knowledge concerning medical problems likely to arise in any large-scale addict rehabilitation program. The author felt that these programs must provide a medical screening and continuous medical supervision. At a time when there is much public concern about drug abuse and addiction, it is hoped by the author that past neglect can be reversed and that physicians will become aware of the problems and be prepared to diagnose and treat them. This report stressed the need for further investigation of the causes of addict morbidity and mortality.

Rho, Yong-Myun. Infections as fatal complications of narcotism. New York State Journal of Medicine, 72(7):823-830, April 1, 1972.

DRUG	Opiates
SAMPLE SIZE	495
SAMPLE TYPE	Addict Deaths Through Infection
AGE	Not Specified
SEX	Both Male and Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	New York City
METHODOLOGY	Exploratory/Descriptive
DATA COLLECTION INSTRUMENT	Autopsy Records
DATE(S) CONDUCTED	1950-1961 and 1969
NO. OF REFERENCES	24

SUMMARY

A series of deaths of narcotic addicts in which infections were a fatal complication were discussed concerning causes of infection, local pyogenic infection, endocarditis, tetanus, viral hepatitis, malaria, and pulmonary infections. Despite the enormous increase in total number of deaths from narcotism, the number of fatal cases of infection is relatively small, and the incidence of this type of complication has not increased in New York City, in large part due to the great increase in the number of deaths from an "acute reaction to drugs."

This report was primarily based on a study of 429 cases of death from infective complications of drug addiction investigated by the Office of Chief Medical Examiner, City of New York, during the years 1950 to 1961, and 96 cases of similar death that occurred during 1969. A total of 2,463 cases of narcotic death which occurred during the same periods were reviewed. The majority of these cases occurred outside hospitals.

Addicts become infected through repeated injections of crudely prepared solutions of drug mixture by unsterilized syringes. Systematic lymphoid hyperplasia seen in chronic addicts may represent an immune reaction of the body to a longstanding insult by infections and to the introduction of various extrinsic materials. Not infrequently an addict injects himself with a narcotic drug while hospitalized for a serious case of infection, and expires; in all cases of addict death a fresh injection site should be carefully sought for and a toxicologic study of organs for narcotics included in the postmortem examination. The paper included a table showing various types of fatal diseases of infection and their relative incidences, a table showing sex ratios and detailed discussions on pathological findings. Direct infection of injection sites of pyogenic organisms, known as "sores" by addicts, is the most common complication, frequently seen in subcutaneous drug users (skin poppers) and only occasionally in intravenous users (main-line- shooters).

While certain pathomorphologic and bacteriologic points of interest are recognized, the paper also noted that there has been too much emphasis placed on unusual cases of bacterial and fungal endocarditis occurring in drug addicts. In recent years the overall characteristics of endocarditis have shown a progressive modification and it may be said that endocarditis occurring in addicts is no more unusual than that seen as a delayed complication of heart valve surgery. Endocarditis was seen more frequently in intravenous addicts than subcutaneous addicts, with men affected more often than women. The entry of primary infection was usually obscure. The valves affected were mitral, aortic and tricuspid, in descending order of occurrence. Staphylococcus aureus was the single most frequent organism isolated. It seems impossible to conclude that there is any close relationship existing between the pathogens and the valves; a broad review of the city's experience with endocarditis in addicts is necessary.

Nearly three-quarters of the cases of tetanus reported in New York City were in addicts, and four-fifths of these were Negro women from the Harlem area. A periodic mass immunization of addicts with tetanus toxoid was suggested. Sex ratios on type of infection

are closely related to mode of injection: female addicts who often inject subcutaneously have the higher incidence of tetanus. Males, who are apt to inject intravenously, have a higher incidence of viral hepatitis, transmitted by the communal use of contaminated needles. Viral hepatitis is the only infective complication of heroin addiction that showed a marked increase in recent years, in remarkable contrast to the incidence of bacterial infections.

Since quinine was added as a diluent of heroin, there have been no cases of artificially-transmitted malaria until recently. Some cases have been reported either in returning veterans from Southeast Asia , or in those who were in the United States but shared the syringes with the infected Indochina returnees. The majority of cases were due to Plasmodium falciparum.

Nonspecific bronchopneumonia and septicoemboli lesions of the lungs comprised approximately 5% of all deaths from narcotism. A variety of organisms, often mixed types, have been isolated from the lung tissues of addicts. The past figure of approximately 3% of deaths from tuberculosis has been steadily declining.

V. OPIATE RELATED DEATH: PATHOLOGICAL FINDINGS

Baden, Michael M. Pathologic Aspects of Drug Addiction. Proceedings of the Committee on Problems of Drug Dependence. Washington, D.C.: Division of Medical Sciences, National Academy of Science, National Research Council, 1969. pp. 5792-5798. (8 references).

SUMMARY

This article, which discussed pathological and other findings in addict deaths, pointed out that the majority of such deaths are due to an acute reaction to the intravenous injection of the heroin-quinine-sugar mixture, often referred to as an "overdose," a term which is a misnomer. Death is not due to a pharmacologic overdose of heroin in the vast majority of cases, as determined by comparison of the analyses of the packets of heroin, syringes and urine from living and dead addicts, which reveal no qualitative or quantitative differences. There is no suggestion at autopsy of an allergic or anaphylactic reaction, but there is evidence of hyperplasia of the reticuloendothelial system which, however, may be unrelated to the sudden death. Sometimes the needle is still in the vein after death, but this does not necessarily imply that the addict died immediately upon injection: he may have been comatose for many hours prior to death, unable to remove the needle, and subject to development of aspiration bronchopneumonia, which is commonly found at autopsy.

The common pathological findings at the autopsy of intravenous addicts ("mainliners") and subcutaneous users ("skin poppers") were described. "Skin poppers" seldom die secondary to an acute reaction, but have a high incidence of tetanus. A third route of heroin use is inhalation ("snorting"), which causes irritation of the nasal mucosa and vasoconstriction, which can lead to perforation of the nasal septum. Opium eating has been noted in some colleges; this bears the danger of death by true overdose due to the content of morphine which is readily absorbed from the gastrointestinal tract.

The so-called "soft" drugs: marihuana, glue, barbiturates, amphetamines, LSD, STP, and an ever-increasing variety of other hallucinogenic substances, do not give rise to any characteristic pathology. They may all cause clouding of the sensorium, transient lack of judgment, faulty perceptions and carelessness, which have led to suicides and other traumatic deaths; LSD in particular has been associated with suicide weeks and months following use of that drug. The "soft" drugs do not usually

cause death by inadvertent overdose, partially because they are obtained in relatively unadulterated form of known quantity.

The article stated that objective determination of the presence of the various drugs of abuse is very effectively accomplished by toxicologic examination of the urine.

Siegel, Henry, Human pulmonary pathology associated with narcotic and other addictive drugs. Human Pathology, 3(1):55-66, March 1972. (13 references).

SUMMARY

This report supports the thesis that the rapid intake of heroin results in pulmonary alterations that may permit a tentative diagnosis of "narcotic lungs" at autopsy. The conditions that determine changes are discussed and other pulmonary changes that have been attributed to the intake of addictive drugs are briefly reviewed.

METHODOLOGY

Previous literature on the subject was surveyed; pathological findings at autopsy, and with light microscopy, were reviewed in detail. Seven photographs are included in the report.

FINDINGS

A diagnosis of "narcotic lungs" can be made at autopsy in 25% of the deaths finally attributed to acute narcotism. Pulmonary vascular talc granulomatosis is the basic chronic lesion found associated with the intravenous injection of addictive drugs. It rarely results in death or overt clinical dysfunction. Death most often follows the intravenous injection of oral preparations containing talc as filler. Its incidence, and the degree of individual lung involvement, vary with different geographic areas, which may reflect the ease with which the addict in an area can obtain pure heroin mixed only with the more commonly used soluble diluents, with no contaminants.

Three types of initial pulmonic reaction to the intravenous injection of heroin can be observed. Most often congestion, edema, and a mononuclear cell response often associated with aspirated material are seen. The observed initial reactions may be the initial response associated with shock and coma, or they may be the direct response to the presence of the narcotic agent in the lung, or the result of a hypersensitivity reaction. The variegated picture represented by "narcotic lungs" can be accounted for by the initial response to aspirated material and the congestion, edema, and mononuclear cell reaction, all modified by the reaction to aspirated acidified gastric contents. Narcotic lungs are found when death has occurred more than 3 hours and up to 12 hours after the last injection.

CONCLUSIONS

With the increasing use of heroin, and the slightly increased number of cases in which fresh needle puncture marks and their effects are not easily apparent, it becomes important to diagnose "narcotic lungs" at autopsy and to institute special procedures for detecting opiates. The mere presence of an opiate in the tissues and some body fluids does not prove that death resulted from narcotism, particularly in the presence of another reasonable cause of death. In such instances quantitative determinations are necessary. Levels of morphine in the kidney greater than 2 mg. per 100 ml. have been reported as indicative of an acute overdose. There are still many cases of death proved to have resulted from acute intravenous narcotism in which an opiate was detected in some body fluids (urine, bile) and tissues, and in which the blood examination yielded negative results even when 400 ml. quantities were analyzed. If blood samples alone are analyzed for addictive drugs, many cases of acute overdose of heroin may be missed. Opiates have even been detected in the urine 2 or 3 days after a single dose. The pathologic picture of "narcotic lungs" has also been observed following methadone ingestion. Similar appearances have been observed in rare instances of young persons dying of asphyxiation due to drowning or following blunt trauma to the trunk. It has also been noted in one case of acute carbon monoxide poisoning due to the inhalation of auto exhaust fumes in which early gaseous postmortem decomposition had set in. However, in these circumstances aspirated material in the inner bronchi was not observed.

Siegel, Henry; Helpern, Milton; and Ehrenreich, Theodore. The diagnosis of death from intravenous narcotism, with emphasis on the pathologic aspects. Journal of Forensic Sciences, 11:1(1-16), 1966.

DRUG	Opiates
SAMPLE SIZE	100
SAMPLE TYPE	Known Addicts
AGE	Not Specified
SEX	Not Specified
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	New York State
METHODOLOGY	Case Studies
DATA COLLECTION INSTRUMENT	Program/Clinic Statistics
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	1

SUMMARY

This study discussed the diagnosis of death from intravenous narcotism with particular emphasis on the autopsy and microscopic pathologic features. Intravenous narcotism was defined as poisoning by the intravenous injection of a narcotic agent or a substance supposed to produce effects similar to those of narcotic agents. In most instances the narcotic agent was heroin. Other substances may be involved if they were taken by the same route and for the same purpose. For this study, 100 consecutive fatalities diagnosed as having resulted solely from intravenous narcotism were considered.

A presumptive diagnosis of death from intravenous narcotism can be made in many cases at the scene where the body was found. A pattern of pathologic changes which involve the lungs, liver and lymph nodes and the injection site was found. Pathogenic mechanisms for these alterations were suggested.

METHODOLOGY

One-hundred recent consecutive fatalities due solely to intravenous narcotism were studied. Narcotism as the cause of death was considered at the scene in 85% of the cases when scarred veins and recent needle puncture marks were present. Nine percent were cases where no needle puncture marks were evident, and in 15% narcotism was not suspected at the scene. The autopsy and microscopic findings yielded the most pertinent information which permitted a positive diagnosis of intravenous narcotism.

FINDINGS

Opiates were detected chemically in the tissues of 30% of the cases but cannot be determined to be necessarily related to the last injection.

Structural pathologic changes resulting from narcotism were found in 4 tissues: the injection sites, the lungs, the lymph nodes, and the liver. The changes refer to observations at the autopsy table, and on histologic sections made from formalin-fixed tissues stained with hematoxylin-eosin.

The lungs were enlarged, firm, and heavy, principally due to congestion and edema. Often aspirated material, particularly gastric in content, was found, particularly in the finer bronchi. Many macrophages were present.

The axillary lymph nodes draining the arm which was injected were usually enlarged and hyperplastic. The lymphocytic hyperplasia of the hepatic and subpyloric lymph nodes could well be the morphologic manifestations pointing to the site of narcotic excretion or metabolism.

Histologic sections were prepared of different areas of liver from the capsule to the porta hepatis both of the right and left lobes. Cells, mainly lymphocytes, were found in the portal areas.

Only a barely discernible needle mark may be present on the skin at the injection site. Sometimes no visible punctures or scars are apparent on the skin, yet fresh hemorrhage will be found in the subcutis.

CONCLUSIONS

A presumptive diagnosis of death from intravenous narcotism can be made in many cases at the scene where the body is found. The positive diagnosis can be made on the basis of the investigation and the complete autopsy.

The authors explained the pathogenesis of the lung lesions as the initial lung reaction of congestion, edema, and macrophagic response associated with shock and coma, or a direct response to the presence of the narcotic agent, or a hypersensitivity reaction. The tissue changes observed may indicate sites of narcotic excretion or metabolism, or indicate the results of nonsterile injections. The role of adulterants in these changes must be evaluated.

Siegel, Henry, and Bloustein, Paul. Continuing studies in the diagnosis and pathology of death from intravenous narcotism. Journal of Forensic Sciences, 15:179-184, April, 1970.

DRUG	Opiates
SAMPLE SIZE	Not Specified
SAMPLE TYPE	Known Addicts
AGE	Not Specified
SEX	Not Specified
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	New York State
METHODOLOGY	Case Study
DATA COLLECTION INSTRUMENT	Laboratory/Examination
DATE(S) CONDUCTED	1966-1969
NO. OF REFERENCES	4

SUMMARY

This presentation brings up to date the continuing study of the diagnosis and pathology of death resulting from intravenous narcotism. Changes in four tissues and organs and effective methods of their detection, are discussed. The importance of recognizing "narcotic lungs" at the autopsy table is emphasized.

METHODOLOGY

Several autopsy methods and identification techniques were used to aid in the diagnosis of death from intravenous narcotic injection.

The best technique found for examining areas where scarred veins or injection sites cannot be found was to make one long incision through the area, and to reflect the skin. The surrounding skin was undermined and reflected by essentially blunt dissection; this exposed a large area with intact veins and with little subsequent cosmetic defect.

"Narcotic lungs" were identified and described as large and over-inflated, with a variegated appearance and prominent lobular markings. These markings could reflect various degrees of aeration, congestion, edema, and hemorrhage in different areas.

Indications of hepatic alterations which commonly occur in about 80% of the cases were identified as cellular accumulation in the portal area, principally lymphocytes, some neutrophilic polymorphs, and the presence of narcotic cells. Where the infiltrate was pronounced, a slight fibrous tissue and bile duct proliferation was present.

In detecting localized lymph node enlargement, the nodes were arbitrarily numbered from 1 to 10 and individually weighed.

FINDINGS

Acute pulmonary changes which permitted the designation "narcotic lungs" at the autopsy table occurred in 20% to 25% of the cases examined.

In about 4% of the cases there were present in a few of the smaller blood vessels essentially colorless doubly refractile crystalline bodies surrounded by a few foreign body giant cells, lymphocytes, and large mononuclear cells. These findings were contrasted with those in a recent report (Johnston, et. al.) indicating a higher incidence of similar foreign body emboli.

Hepatic alterations occurred in about 80% of the cases. The longer the period of continuous narcotism, the more marked was the cellular infiltrate. This was most noticeable in younger individuals.

Regarding lymph node enlargement, the hepatic and subpyloric lymph nodes were found to be two to four times the normal size, though not all nodes were always involved.

CONCLUSIONS

With the present slightly increasing incidence of deaths occurring in younger people, and the slightly increased incidence of cases

where scarred veins and needle puncture marks are not apparent, the authors suggest that it becomes increasingly important to diagnose "narcotic lungs" at the autopsy table, and thus to institute special procedures for the detection of opiates. Four years previous, opiates were only detected in about 1/3 of the cases. Greater interest and improved methodology have now permitted these drugs to be detected in more than 70% of the cases. The authors conclude that it is important for forensic pathologists to be able to identify "narcotic lungs," since opiates may not be detected in some cases.

The diagnosis of death from intravenous narcotism can only be arrived at after the proper interpretation of all the facts elicited by the investigation from the autopsy, and from the necessary laboratory examinations. The presence or absence of one criterion neither proves nor mitigates against such a diagnosis.

Johnston, Edward H.; Goldbaum, Leo R.; and Whelton, Richard L. Investigation of sudden death in addicts: With emphasis on the toxicologic findings in thirty cases. Medical Annals of the District of Columbia, 38(7): 375-380, 1969.

DRUG	Not Specified
SAMPLE SIZE	30
SAMPLE TYPE	Known Addicts
AGE	Adults (17-45 years of age)
SEX	29 Male and 1 Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	Washington, D.C.
METHODOLOGY	Case Study
DATA COLLECTION INSTRUMENT	Laboratory/Examination
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	3

SUMMARY

A major problem in the investigation of sudden deaths of drug addicts has been the failure to isolate and identify the narcotic substance in tissues and body fluids. A series of 30 cases of sudden death in known narcotics addicts was studied with a procedure developed by the Toxicology Branch of the Armed Forces Institute of Pathology. In addition, all available tissue was studied for histopathologic alterations.

Morphine was detected in the body tissue and fluids of all 30 cases. Tables included show toxicological and autopsy data as well as individual circumstances surrounding each death. Cases included 22 known addicts who died as a result of intravenous narcotic injection, and 8 who died of other causes (such as gunshot wounds or automobile accidents).

The authors reached two main conclusions: (1) that the concentration of morphine in the kidneys appears to be a good indicator of death occurring after a recent injection of narcotics, and (2) that polarized light is useful in detecting lung tissue lesions produced by foreign material in the pulmonary vessels.

METHODOLOGY

The purpose of this study was to determine whether a procedure developed by the Toxicology Branch of the Armed Forces Institute of Pathology would detect very low concentrations of morphine in biologic samples, and if data so obtained would aid in the diagnosis of death from intravenous narcotic injection. Thirty cases of sudden death in narcotics addicts were studied. The study included 29 males and 1 female, ranging in age from 17 to 45. All case material was contributed by the Office of the Coroner, District of Columbia.

All organs and body fluids were hydrolized so that the presence of morphine, both free and conjugated, could be determined by use of the characteristic ultraviolet spectrum following extraction.

Tissue from the lungs and other organs was studied microscopically in 18 of the 30 cases. The presence in the pulmonary vessels of foreign material that was doubly refractile with polarized light stimulated the careful study of all available lung tissue by this technique.

FINDINGS

The tissue alterations in the present series of addicts did not differ from those previously described in other studies, except for additional alterations in the lungs. Morphine was detected in the body tissues and fluids of all 30 cases. The pulmonary vessels revealed a number of very early lesions produced by intravascular foreign material.

In every case the presence of morphine was detected by the procedure, even in cases where death occurred soon after an intravenous injection. Morphine was identified and the quantity determined in bile, urine, kidney, and in some instances in blood and liver. Concentrations of 0.2 mg./100gm. of morphine, or more, were present in the kidneys only of those in whom death was

caused by intravenous narcotism, the concentration being much lower in addicts found dead from other causes. The concentrations of morphine in the bile and urine showed little significant difference.

In 14 of the cases found to have foreign material in pulmonary vessels, 12 had foreign bodies that were refractile to polarized light. In 10 cases the refractile crystals were identified as talc. Granulomatous vasculitis in pulmonary vessels has been reported to result from the intravenous injection of narcotics and drugs intermixed with talc.

CONCLUSIONS

Morphine was detected in the body tissues and fluids of 30 cases of sudden death following intravenous injection of narcotic. The authors conclude that the concentration of morphine in the kidneys appears to be a good indicator of death occurring after a recent injection of narcotic, while concentration in the bile and urine is not a good indicator. It is recommended that polarized light be used routinely in the microscopic examination of lung tissue in addicts, so as to detect lesions produced by foreign material in the pulmonary vessels.

Pearson, J.; Challenor, Y.; Baden, M.; and Richter, R. The neuropathology of heroin addiction. Journal of Neuropathology and Experimental Neurology, 31(1):165-166, January 1972.

ABSTRACT

Heroin addiction accounted for at least 1149 deaths in New York City in 1970; severe reactions followed by survival outnumbered fatal cases by about twenty to one. Neurological complications of the use of adulterated narcotics included delirium, convulsions, coma, impairment of intellect, personality changes, Parkinsonian-like states, acute transverse myelitis, and amblyopia. Plexitis, peripheral neuropathies and muscular dysfunction (sometimes associated with myoglobinuria) occurred remote from sites of injection. A preliminary survey of autopsied cases in which there was no evidence of current infection has shown astrocytic plasmatodendrosis in most cases, diffuse brain swelling in somewhat fewer instances, degenerative and reactive changes in the globus pallidus, necrosis of spinal gray matter, and pathologic changes in muscle. Clinical muscle and nerve biopsies have shown chronic inflammation of, and degenerative changes in, peripheral nerves, neurogenic atrophy of muscle, myofiber tubular aggregate formation and rhabdomyolysis followed by regeneration.

Coma has preceded a minority of the clinically observed syndromes. Evidence suggests that reactions may not be due to a simple overdose of crude heroin. Studies are in progress to assess the contributions of the many adulterants taken with heroin (e.g. quinine, procaine, lactose, dried milk), the mode of administration, and dosage, and to investigate the possible role of hypersensitivity phenomena.

Adelman, Lester S., and Aronson, Stanley M. The neuropathologic complications of narcotics addiction. Bulletin of the New York Academy of Medicine, 45(2):225-234, February 1969.

DRUG	Heroin; Morphine
SAMPLE SIZE	11
SAMPLE TYPE	Treatment (inpatient)
AGE	Adults (24-66)
SEX	9 Male; 2 Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	Brooklyn, New York
METHODOLOGY	Case Studies
CATA COLLECTION INSTRUMENT	Laboratory/Examination
DATE(S) CONDUCTED	1959-1968
NO. OF REFERENCES	16

SUMMARY

This report described detailed pathological findings in the tissues of the central nervous system of patients who were addicted to narcotics. In this series of 11 cases, the frequency of organic disease of the nervous system related to narcotics was higher than anticipated or previously reported.

METHODOLOGY

Data were obtained from the autopsy files of the neuropathology laboratory, Kings County Hospital Center, Brooklyn, New York,

which contained the records of 11 patients autopsied between 1959 and 1968 who had been identified as being addicted to narcotics. Each brain was cut in the coronal plane at intervals of 1 cm. Blocks of tissue for histologic study were obtained from the frontal lobe, hippocampus, basal ganglia, hypothalamus, midbrain, pons, cerebellum, and medulla in each case. Spinal cord, peripheral nerve, dura mater and skeletal muscle were also examined when available. Additional sections were obtained when indicated.

FINDINGS

Nine of the 11 patients revealed abnormalities of the central nervous system at the time of autopsy; in 6 cases this abnormality was related to the cause of death. Seven of the 11 patients died of infectious disease; six of these showed lesions in the central nervous system. Bacterial endocarditis constituted the single most frequent cause of death in the series (4 cases) and these exhibited most of the possible neuropathologic sequelae. In the central nervous system, metastatic foci of infection were found in the 3 cases in which the brain was examined. Staphylococcus aureus (coagulase positive) was cultured antemortem from the blood in 3 of these 4 cases while Flavobacter was cultured antemortem from the blood of the fourth. One patient showed granuloma of the brain due to phycomycetosis. Fatty degeneration of neurons, which has been previously described in association with narcotic addition, was not observed. No lesions characteristic of the addictive state per se were found.

CONCLUSIONS

In previously reported cases of narcotic addiction examined at autopsy, the cerebral changes have been described only where judged to be significant. This report of a small series of autopsied patients addicted to narcotics indicated that the neuropathologic complications of narcotics addiction may be more frequent than previously suspected.

Force, Elizabeth E.; Fisher, Russell S.; and Millar, Jack W. Epidemiological and ecological study of risk factors for narcotics overdose: IV. Retrospective histopathological study of lungs in cases of fatal narcotism: Comparative analysis for potential hypersensitivity reaction. Archives of Environmental Health, 26(3): 111-119, March 1973.

DRUG	Heroin
SAMPLE SIZE	287
SAMPLE TYPE	Deaths
AGE	Not Specified
SEX	Both Male and Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	Maryland and Washington, D.C.
METHODOLOGY	Controlled/Experimental
DATA COLLECTION INSTRUMENT	Program/Clinic Statistics; Laboratory/Examination
DATE(S) CONDUCTED	1968-1971
NO. OF REFERENCES	20

SUMMARY

Results were reported from a comparative, histopathological study of cases of (1) fatal narcotism, (2) addicts with death due to other causes, (3) nonaddict controls, (4) nonaddict hypersensitivity deaths, (5) nonnarcotic drug overdose deaths, and (6) nonaddicts with fatal liver disease. The purposes of the study were: (1) to determine whether bilateral pulmonary edema associated with fatal narcotism was an identifiable hypersensitivity reaction, and (2) to identify risk factors for fatal narcotism.

METHODOLOGY

The groups used in this study were:
(1) addicts with fatal narcotism--105 cases selected from 168 cases coming to necropsy in the Office of the Medical Examiner, State of Maryland, 1970-1971.
(2) addicts with deaths from other causes--24 cases matched by age, sex and race with group (1).
(3) nonaddict controls with deaths from all causes--100 cases randomly selected to match group (1) by age, sex, race and month of death. (Also served as a control for cases of traumatic injury.)
(4) nonaddict hypersensitivity deaths--32 cases, of which 21 died of bronchial asthma, 1 of halothane hypersensitivity, 2 of lidocaine reaction, and 8 of penicillin anaphylaxis.
(5) nonnarcotic drug overdose deaths--20 suicide cases, mainly females (12 of 20) with average age of approximately 39.5 years.
(6) nonaddicts with fatal liver disease--10 cases, predominantly Black males with an average age of 40.3 years.

FINDINGS

The occurrence of seasonal variation in narcotics overdose reaction was investigated to test the hypothesis that heroin-induced edema may involve more than the physiological response to acute intoxication. Numbers of cases of fatal narcotism were computed on a monthly basis for the years 1968 through 1971. The number of narcotic deaths markedly increased during the June to October period of each year from 1969 to 1971. Deaths were not clustered in a daily or weekly pattern of occurrence for any given month of the year. By questioning 50 addicts participating in a narcotics treatment program it was learned that seasonal overdose may be due to the following factors: (1) during warm summer months a lower dose of heroin may produce a narcotic-induced "high", so that an addict shooting the usual winter dose may suffer an overdose reaction; (2) because of the lower dosage requirement in the summer, addicts buy less heroin, the supplies are greater, and purer heroin of increased strength is sold; (3) drug traffic into the U.S. was presumed to be greater during the summer months so that there are more street pushers, more and purer heroin; (4) the addict population is more physically active during summer months and some require larger doses to get "high" with the increased possibility of an overdose.

Pulmonary and histopathological findings revealed the following: (1) for groups "(1)" and "(2)" increased lung weight, bilateral pulmonary edema, and congestion were significantly associated with fatal

overdose; (2) the case rate for pulmonary edema (17%) was lower than expected for the control group "(3)" in which 76% of the deaths were due to traumatic injury. Data presented in Tables 4 through 6 of the article did not indicate addict-specific risk factors or mechanisms associated with fatal overdose reaction. However, the overall pathological picture for each group suggested different mechanisms for host reactions. This study of pulmonary abnormalities indicated that fatal narcotism is not the result of a hypersensitivity reaction. With regard to group "(6)" pulmonary edema and bronchopneumonia were not bilateral but bronchopneumonia and intestinal fibrosis were significantly associated with fatal liver disease.

CONCLUSIONS

The data studied: (1) did not disprove a cell-mediated delayed hypersensitivity reaction as a causative mechanism for fatal lung reactions in narcotics addicts; (2) did not demonstrate asthma and food and drug allergies to be risk factors in narcotics overdose; and (3) could not show a relationship between chronic inflammatory hepatic disease and the development of pulmonary edema in cases of fatal narcotism.

VI. OTHER DRUG RELATED DEATH

Setter, John G.; Maher, John F.; and Schreiner, George E. Barbiturate intoxication. Archives of Internal Medicine, 117(2): 224-236, February, 1966.

DRUG	Barbiturates
SAMPLE SIZE	163
SAMPLE TYPE	Treatment (inpatient)
AGE	Not Specified
SEX	36 Male and 127 Female
ETHNICITY	4 Black and 159 White
GEOGRAPHICAL AREA	Washington, District of Columbia
METHODOLOGY	Exploratory, Descriptive
DATA COLLECTION INSTRUMENT	Laboratory/Examination
DATE(S) CONDUCTED	February 1951 to June 1965
NO. OF REFERENCES	39

SUMMARY

This report presented information gained from the study of severe barbiturate poisoning. Barbiturate intoxication continues to be a public health hazard despite improved therapy. Advocates of analeptic, conservative, diuretic, and dialytic therapy have presented their respective cases, without producing a universally accepted approach to therapy, and a high annual mortality persists. The authors felt this report was particularly valuable because: (1) all patients were studied in depth by the Renal and Electrolyte Division of Georgetown University Hospital, rather than reviewed in a record room series; (2) they were selectively referred

because of severity; (3) the study includes a long-term evaluation of therapy by hemodialysis, recent experience with peritoneal dialysis, a program of forced diuresis, and a period of trial with analeptics; and (4) unlike other studies most of the patients took short-acting barbiturates.

METHODOLOGY

One-hundred seventy-three cases of barbiturate intoxication were studied in 163 patients of which 36 were male, between February, 1951, and June, 1965. There were repeated episodes of poisoning in 10 instances. After initial hydration and aeration, the severity of the intoxication in individual patients was determined by criteria established for its measurement. All available sources of information were investigated concerning the type, amount, and time of drug ingestion, concomitant alcohol intake, and prior habitual use of barbiturates. The group of patients took 11 different generic types of barbiturates, either alone, in mixtures, or combined with other drugs. The quantity ingested was known with reasonable accuracy in about half the cases. Evidence of pre-existing diseases, such as hypertension, diabetes and cirrhosis were sought during the initial examination. Findings compatible with trauma were also sought. Serial recording of neurologic finds, bowel sounds, vital signs, and eye reflexes allowed assessment of the patient's progress.

FINDINGS

Analysis of the cases treated revealed that intoxication with short-acting barbiturates caused deeper coma and more severe complications than phenobarbital poisoning. The average ingestion of secobarbital was 33 tablets of 100 mg., and pentobarbital 31 tablets of 100 mg., whereas the average for phenobarbital was 3.0 gm. (50 tablets of 60 mg.). Absent pupillary light reflexes indicated a poor prognosis. The outlook was good if the corneal reflex was present.

Serum barbiturate levels helped in assessing the severity of the intoxication, and to predict the duration of coma when certain variables were controlled, notably concomitant alcohol intake, habitual intake and analeptic therapy. The duration of coma correlated with the blood phenobarbital level using the formula $y=0.15x + 3.65$, and was related to the blood level of short-acting barbiturates by $y=0.035x + 1.46$.

Analeptic therapy disrupted the natural course of barbiturate poisoning, but impaired interpretation of neurological findings, and had little substantial effect on morbidity or mortality. Maintenance of a free airway, and assisted ventilation using a slow

rate and room air, were important supportive measures. Forced diuresis increased the excretion of phenobarbital, but was less effective in secobarbital or pentobarbital poisoning.

Hemodialysis was more efficient than all modifications of peritoneal dialysis and diuresis, and its benefit was additive to these procedures. Comparative clearances for the 3 types of therapy were 30, 4 to 8, and 3 to 4 ml/minute, respectively.

CONCLUSIONS

Mortality was 12.7% in this series of patients with barbiturate intoxication, selectively referred because of severity. Massive dosage, delay in instituting appropriate therapy, advanced age, and cardiopulmonary complications were often seen in those who died.

Richman, Alex, and Orlaw, Richard. Barbiturate mortality as an index of barbiturate use, Canada, 1950-1963. Canadian Medical Association Journal, 93(26):1336-1339, December 25, 1965.

DRUG	Barbiturates
SAMPLE SIZE	Canadian Population
SAMPLE TYPE	Deaths
AGE	Adults (18-64)
SEX	Both Male and Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	Canada
METHODOLOGY	Statistical Study
DATA COLLECTION INSTRUMENT	Statistics
DATE(S) CONDUCTED	1950-1963
NO. OF REFERENCES	11

SUMMARY

Based on an analysis of Canadian mortality during the period 1950-1963, statistics indicated that increased mortality from barbiturates has been accompanied by decreased mortality from inhalation of utility gas, while overall mortality from suicide or accidental poisoning has not changed.

It was assumed from this study that increased mortality from barbiturates represented a change in fashion in regard to methods of suicide.

METHODOLOGY

An analysis was made of the annual number of deaths, total and age-specific, *1950-1963, and of population-based ratios for various* demographic groups for the following causes of deaths: (a) all suicides, (b) all accidental poisonings, (c) all poisonings by barbituric acid, and (d) all accidental poisoning and suicide by utility gas.

FINDINGS

The absolute number of reported suicides in Canada increased by 1/3 from 1,068 in 1950 to 1,436 in 1963. Accidental deaths from all poisons increased from 288 in 1950 to 384 in 1963. Deaths attributed to barbiturates quadrupled from 63 in 1950 to 232 in 1963. Mortality was higher in females than in males, and was highest in females aged 45-64.

Mortality from domestic gas decreased from 187 in 1950 to 29 in 1963. Marked decreases occurred in all age-sex groups, with the exception of males aged 15 to 24, amongst whom the ratio remained constant.

Combined rates for deaths from utility gas and barbiturates declined steadily for most groups between 1950-1952, and 1959-1963. Between 1950-1952 and 1959-1963 these rates remained constant for females aged 45-64, and increased slightly for males aged 15-24 and for females aged 25-44.

Decreased mortality from utility gas and increased death from barbiturates was not sufficient evidence to assume increased barbiturate use. Alcohol also played a considerable part in the barbiturate deaths, as earlier studies in England and California had indicated.

CONCLUSIONS

Mortality from barbiturates may represent a change in fashion in regard to method of suicide. Mortality from barbiturates was not found to be a valid index of the extent of barbiturate use in the general population.

The extent to which alcohol has contributed to deaths from barbiturates has been considerable but that was not included in this study.

More direct evidence of changes in the nature and extent of barbiturate usage is required.

Davis, John M.; Bartlett, Edward; and Termini, Benedict A. Overdosage of psychotropic drugs: A review. I. Major and minor tranquilizers. Diseases of the Nervous System, 29(3): 157-164, March 1968. (71 references).

SUMMARY

The literature on overdosage of major and minor tranquilizers was reviewed. The purpose of the review was to analyze data relevant to determining the amount of medication which can be dispensed safely at one time to a psychiatric patient, and to discuss clinically important aspects of the management of cases of psychiatric drug overdoses.

METHODOLOGY

In addition to the literature review, poison control centers, the National Clearinghouse for Mental Health Information, the Food and Drug Administration, and drug companies were contacted for information on overdoses. The data showed considerable variation in the completeness and exactness of the cases described. For purposes of classification, each case was placed arbitrarily into one of 3 categories: fatal, severe, or nonsevere intoxication. Patients were placed in the nonsevere category if they were unconscious for less than 10 hours, and in the severe category if they were unconscious for more than 10 hours or if other obviously severe effects were noted. Incompleteness of reports and inexact use of terminology made other definitions of severe and nonsevere intoxication difficult.

The data could not be assumed to be absolutely accurate, particularly in terms of the dose ingested. In many cases, these were only rough estimates, since it is difficult to determine the number of pills a patient has taken, particularly if the patient does not survive. Accordingly, the highest and lowest doses were given (when appropriate) in each category; there was a wide variation in the dose levels within each. The cases cited in figures and tables in this study were pure intoxications, in which no evidence existed to implicate any other drug or alcohol. Since it is possible that other factors may have been important in causing the fatalities, it cannot be assumed that all are due solely to the drug ingested.

FINDINGS

A total of 720 cases of pure meprobamate (Miltown, Equanil) poisoning was found. There were 16 fatalities and the amount of drug ingested was known for 9 of these. Four deaths occurred after ingestion of over 40 grams, 1 at 36.8 grams, and 4 after ingestions of 12 to 40 grams. It was not unusual for patients to withstand single doses of from 12 to 40 grams. Meprobamate overdose was characterized by coma with low blood pressure, slow pulse, low body temperatures and occasional atelectasis. Deep coma was generally associated with plasma meprobamate concentrations above 10 mg% while light coma was usually found at levels from 6 to 12 mg%. Patients more frequently died of the complications produced by coma than the coma per se.

Twenty-one cases of overdose with chlordiazepoxide (Librium) were reviewed. No deaths were reported. Many patients have no serious effects from doses higher than 600 mg. Intoxication was usually accompanied by drowsiness, oversedation, ataxia, muscle relaxation, and coma. Of the 4 cases of diazepam (Valium) and 2 cases of exazepam (Serax) overdosage reported, only 1 was severe. There were no deaths.

A total of 186 pure cases of chlorpromazine (Thorazine) poisoning were found, 78 of them in children. Seven fatalities were reported, 4 of them involving children with doses ranging from 20 to 74 mg/kg. For the 3 adult deaths it was difficult to determine whether the drug was the sole or primary cause of death. Two fatal cases of combined chlorpromazine-barbiturate poisonings were reported.

Twelve cases of thioridazine (Mellaril) overdosage were reported, 3 of them deaths from doses ranging from 1.5 to 8 grams.

A total of 221 intoxications from phenothiazines (Prolixin, Trilafon, Stelazine) were reported, 46 in adults, 175 in children, with 1 fatality: a 21-month-old child whose death was classified as terminal pneumonia. Because of the low occurrence of coma, deaths from phenothiazine derivatives are better classified as idiosyncratic reactions rather than fatal overdoses.

CONCLUSIONS

When a practicing physician prescribes psychotropic medication to a patient with suicidal tendencies, there is always a risk. There are methodological difficulties of a serious nature which limit any

conclusions concerning the lethality of psychotropic medications. However, since physicians continue to prescribe these drugs on an outpatient basis, it is necessary to arrive at some estimate, though limited, concerning their relative toxicity.

Peele, Roger, and Von Loetzen, Idella S. Phenothiazine deaths: A critical review. American Journal of Psychiatry, 130(3):306-309, March, 1973.

DRUG	Phenothiazine
SAMPLE SIZE	65 Phenothiazine Deaths, 94 Lethal Catatonia
SAMPLE TYPE	Deaths
AGE	Cross-Age
SEX	85 Male and 74 Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	Not Specified
METHODOLOGY	Exploratory/Descriptive
DATA COLLECTION INSTRUMENT	Clinic Statistics
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	17

SUMMARY

This paper compared the sudden, unexplained deaths attributed to phenothiazines with those sudden unexplained deaths attributed to lethal catatonia.

Nearly all differences in findings could be explained on some other basis than that there is such an entity as phenothiazine death.

The study raised doubts and questions as to the existence of "phenothiazine death," but concluded that the possibility of its existence could not be completely disproved.

METHODOLOGY

The author hypothesized that phenothiazine death is not a real entity. Any significant difference between the lethal catatonia group and the phenothiazine death group can be explained by the inclusion of the autopsy-negative cardiac deaths.

English, French, German and Italian literature were surveyed for cases that were called phenothiazine deaths, and for cases of lethal catatonia or one of its equivalents.

Twenty-seven studies were found describing 65 cases considered to be lethal catatonia. The 2 groups were compared according to sex, age, month of death, diagnosis, reports of hyperpyrexia, and length of hospitalization.

FINDINGS

The investigation revealed no significant difference by chi square for sex, but there was a significant difference between the 2 groups for age at death.

The phenothiazine death group included more men (not significant), more older patients and patients hospitalized for a longer period, and had a broader range of diagnoses.

There was no significant difference in month of death between the 2 groups, although literature of lethal catatonia had suggested that deaths attributed to this cause were more common in the warmer months.

Findings supported the hypothesis that phenothiazine death includes 2 groups, lethal catatonia and autopsy-negative cardiac deaths.

CONCLUSIONS

It would appear that sudden, unexpected, autopsy-negative death in a patient receiving phenothiazines should not be attributed to phenothiazines, since there are 2 previously known groups in which the patient's death might be categorized: cardiac death that is sudden and unexpected, and autopsy-negative or lethal catatonia.

Although the survey raised doubts about the existence of "phenothiazine death," the possibility of its existence could not be completely disproved.

Matthew, Henry; Roscoe, Peter; and Wright, Noel. Acute poisoning: A comparison of hypnotic drugs. The Practitioner, 208:254-258, February, 1972.

DRUG	Depressants (Hypnotics)
SAMPLE SIZE	1,176
SAMPLE TYPE	Treatment (outpatient)
AGE	Not Specified
SEX	Not Specified
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	Edinburgh, Scotland
METHODOLOGY	Exploratory/Descriptive
DATA COLLECTION INSTRUMENT	Observations
DATE(S) CONDUCTED	January 1, 1968 to June, 1970
NO. OF REFERENCES	24

SUMMARY

Self-poisoning with hypnotics obtained on prescription is common; therefore the authors considered that an important factor influencing the choice of hypnotics should be their relative safety in overdosage. This article reports 2 1/2 years of study of poisoning by barbiturates, methaqualone with or without diphenhydramine ("mandrax", "melsedin", "quaalude"), nitrazepam ("mogadon"), glutethimide ("doriden"), ethchlorvynol ("serensil", "arvynol"), carbromal with pentobarbitone ("carbrital") and chloral derivatives ("welldorm", "tricloryl").

Patients admitted to the Regional Poisoning Treatment Center, Royal Infirmary, Edinburgh were studied as to which drug was the chief cause of poisoning. The depth of coma was graded, and the duration of the coma was defined. The effects of drugs were also compared in terms of respiratory depression, degree of hypotension, incidence of renal failure, and death rate.

Only 2 of the 1,176 patients died. One death was due to a barbiturate, and a glutethimide was said to have caused the other. Three additional patients with barbiturate intoxication developed renal failure. The authors concluded that nitrazepam should be the hypnotic of choice for all patients who are at risk from overdosage. They endorsed the view that barbiturates should no longer be prescribed as hypnotics and that phenobarbitone is justified only as an anticonvulsant.

METHODOLOGY

Beginning January 1, 1968, and continuing for 2 1/2 years, admissions to the Regional Poisoning Treatment Center, Royal Infirmary, Edinburgh, for acute poisoning totalled 2,820. It was considered on clinical grounds that one of the drugs enumerated above was the chief cause of poisoning. Grades of unconsciousness were determined, and duration of coma was defined as extending from time of admission until simple vocal commands were obeyed. Management consisted of supportive therapy, and peritoneal or haemodialysis was carried out only for renal failure.

The adoption of measures involved, e.g., artificial ventilation or blood volume expansion, depended on the same criteria throughout the period of study. The effects of hypnotics were compared for: (a) depth and duration of coma; (b) respiratory depression, as indicated by need for endotracheal intubation, bronchoscopy or assisted ventilation; (c) degree of hypotension (need for elevation of foot of bed, vasopressor agents, or blood volume expansion); (d) incidence of renal failure requiring peritoneal or haemodialysis; and (e) death rate.

FINDINGS

Only 2 of 1,176 patients died. One was due to a barbiturate, the other was due to glutethimide. Three patients developed renal failure from barbiturate intoxication; 2 were haemodialysed and the other required peritoneal dialysis. One patient with ethchlorvynol poisoning also showed renal failure.

Over 70% of cases of hypnotic poisoning studied at this unit were due to barbiturates. A little under 10% of the patients poisoned in this manner were unconscious for longer than 18 hours. Twelve percent (183) of the patients required endotracheal intubation,

and 1/3 of these (28) required assisted ventilation. Thirty-eight patients also required maintenance by intravenous fluids. Two-hundred of the 706 barbiturate-poisoned patients required therapy for hypotension. A vasopressor agent or blood volume expansion was necessary for 34.

Of the 301 methaqualone poisoning cases encountered, almost all were attributed to "mandrax." The spectrum of poisoning was similar to the barbiturate poisoning, but less severe. The drugs carbromal, chloral, ethchlorvynol, and glutethimide show the usual features of hypnotic poisoning in about equal incidence. However, protracted unconsciousness from ethchlorvynol and hypotension from glutethimide considerably enhance their toxicity.

Of 102 patients poisoned by nitrazepam none was deeply unconscious and unconsciousness never continued more than 12 hours. Intensive cardiorespiratory care was unnecessary, and no complications occurred in management.

CONCLUSIONS

The authors suggested that nitrazepam should be the choice hypnotic for all patients who are at risk from overdosage. They recommended that barbiturates no longer be prescribed as hypnotics, and that phenobarbitone be used only as an anticonvulsant. They saw little, if any, indication for the use of glutethimide, chloral derivatives, methaqualone, ethchlorvynol, or carbromal with pentobarbitone.

Kramer, John C. Introduction to amphetamine abuse. In: Ellinwood, Everett H. and Cohen, Sidney, eds. Current Concepts on Amphetamine Abuse. Proceedings of a workshop, Duke University Medical Center, June 5-6, 1970. Washington, D.C.: U.S. Government Printing Office, 1972. pp. 177-184. (28 references).

SUMMARY

The motto "Speed Kills" is cute, short enough to fit on a button, and carries a message of concern. It is not altogether accurate. Very few deaths have been recorded in which overdose of amphetamines has been causal.

Though viral hepatitis and other infections are common and persistent among intravenous amphetamine users, again only a few deaths related to infection have been recorded. Death by violence might add a few more names, but investigation of records at the offices of the Los Angeles County Coroner and of the San Francisco County Coroner revealed that only one or two deaths per year in each county could be attributed to overdose and a like number to other events possibly related to amphetamine use.

The rarity of death may be due to the tolerance produced by these drugs and the relatively high ratio of effective dose to fatal dose. Dr. David Smith of the Haight-Ashbury Clinic and Amphetamine Research Project indicates that the two deaths he has seen were both in individuals who were relative novices in amphetamine use.

Chlorpromazine (and probably other phenothiazines) have been shown to be effective in suppressing amphetamine effects both clinically and in animals. Barbiturates, though not without effect, are less valuable and introduce the hazard of barbiturate toxicity. These findings have been confirmed by acute, intravenous lethality studies in the laboratory. The author found that intravenous injection of methamphetamine, d-amphetamine and d, l-amphetamine each produced rapid death in toxic doses (usually within 2 to 3 minutes, though 10 minutes were allotted for experimental purposes). Those animals which did not succumb promptly usually survived for at least six hours. Because of the rapidity of death, such conditions as grouping, room temperature, or activity did not enter into consideration. Several findings of interest emerged: 1) unlike the results found with intraperitoneal injection, the LD/50 curves were sharp and consistent; 2) the lethality of each of the three substances was approximately the same; and 3) chlorpromazine (CPZ) in doses of 5 mg/kg raised the LD/50 from about 35mg/kg to about 55 mg/kg.

Besides confirming the usefulness of chlorpromazine in antagonizing the effects of phenethylamines, these experiments also suggest that the antagonism is based not merely on the tendency of CPZ to diminish hyperactivity (though this may be one mechanism of action), but also on alteration of biochemical events within the tissues.

Though human deaths due to amphetamines are not common, some clinical and pathological descriptions have been published. In a recent report, Cravey and Baselt describe a young man who swallowed two packets of methamphetamine when confronted by police. Within half an hour he appeared delusional and was responding to hallucinations. When hospitalized he was cyanotic and had a temperature of 104, a pulse of 102, and blood pressure of 74/50. He was in severe acidosis. He died 5 1/2 hours from the time of ingestion. This and other reports and unpublished case histories indicate that marked hyperpyrexia and shock usually precede death from amphetamines.

Pathological findings in both man and animals are generally nonspecific, showing pulmonary congestion and often congestion of other organs, including the brain. Petechial hemorrhages in various organs (including the brain) are frequently but not uniformly described. Only rarely is massive hemorrhage noted.

The author found no first-hand reports in the Western medical literature describing a histological picture of damage to human brain cells, though Lemere referred to an article by Tatetsu citing histopathological evidence (lobotomy and postmortem of permanent organic brain damage). In two of six deaths due to amphetamine overdose reported by the San Francisco coroner, petechial hemorrhages were noted in brain tissue.

Davis, John M.; Bartlett, Edward; Termini, Benedict A. Overdosage of psychotropic drugs: A review. II. Antidepressants and other psychotropic agents. Diseases of the Nervous System, 29:246-256, April 1968. (90 references).

SUMMARY

The literature on overdosage of antidepressants and other psychotropic drugs was reviewed. The purpose of the review was to analyze data relevant to determining the amount of medication which can be dispensed safely at one time to a psychiatric patient and to discuss clinically important aspects of the management of cases of psychiatric drug overdoses.

METHODOLOGY

See Methodology section of abstract for Davis, John M., et al. Overdosage of psychotropic drugs: A review. Part I. Major and minor tranquilizers.

FINDINGS

Two hundred and three cases of poisonings with tricyclic (imipramine-type) antidepressants were located in adults. Twenty resulted in fatalities with a mean fatal dose of 2166 mg. There were 34 cases of overdosage reported in children, with 14 fatalities, 11 from imipramine in doses as low as 20 to 35 mg/kg, 2 from amitriptyline (90 and 123 mg/kg) and 1 from desipramine (2500 mg ingested in a short time period). An imipramine-type overdose is characterized by coma with shock, respiratory depression, temporary agitation or delirium, convulsions, hyperreflexive tendons, clonic movements, bowel and bladder paralysis, disturbance of temperature regulation, mydriasis, and disturbances of cardiac rhythm. The most serious toxic effects are convulsions. Amitriptyline, in particular, has been reported to have a potentiating effect when taken with ethyl alcohol. Some cases show clinical improvement, then sudden collapse and death.

Eleven fatalities were reported from monoamine exidase (MAO) inhibitors, 4 due to Parnate, 6 to Nardil, and 1 due to Niamid.

Overdoses of MAO inhibitors typically show no symptoms for up to 12 hours. Characteristics of MAO inhibitor intoxication include coma with hyperthermia, an increase in respiratory rate, tachycardia, dilated pupils and hyperactive deep tendon reflexes.

Barbiturates and sedatives are more lethal than any of the other drugs discussed. As little as 5-10 grams of glutethimide may result in fatal consequences. Death after ethchlorvynol has occurred at a blood level of 14 mg% which is about 10 times the maximal level reached after ingestion of 1 gram. Serious coma results after 5-10 times the therapeutic dose of barbiturates. In 1963, it was estimated that 75% of drug suicides resulted from barbiturates.

Amphetamines can also be toxic, producing a clinical picture of overstimulation. Death has been reported from hyperpyrexia, intracranial hemorrhage, or cardiovascular collapse. Based on animal studies, the lethal dose for adults is estimated to be 20 mg/kg.

CONCLUSIONS

MAO inhibitors pose problems both with overdoses and with hypertensive crises caused by combination of the MAO inhibitor with other drugs or with certain foodstuffs; therefore close management of patients receiving these drugs is indicated. Barbiturates, because of the high fatality rate associated with overdoses, should be dispensed in small amounts, if at all, to the suicidal patient.

It is not possible to calculate a toxicity curve comparing dose ingested to percent fatality since few persons ingest high enough doses.

Koch, B., et al. Renal papillary necrosis and abuse of analgesics. Canadian Medical Association Journal, 98:8-15, January 6, 1968.

DRUG	Analgesics
SAMPLE SIZE	26 Cases
SAMPLE TYPE	Treatment (inpatient)
AGE	Adults; Aged
SEX	9 Male; 17 Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	Ottawa, Canada
METHODOLOGY	Case Studies
DATA COLLECTION INSTRUMENT	Laboratory/Examination; Program/Clinic Statistics
DATE(S) CONDUCTED	1961-1966
NO. OF REFERENCES	36

SUMMARY

A low incidence of analgesic nephropathy, a drug-induced illness, has been suggested in Canada, in contrast to the experience in several European countries and in Australia. The authors reviewed the problem of renal papillary necrosis and analgesic nephropathy at the Ottawa Civic Hospital.

METHODOLOGY

Twenty-six cases of papillary necrosis were found in the records of the 195,004 patients admitted to the Ottawa Civic Hospital during the years 1961-1966, including 15 with a history of abuse with analgesics. All available clinical and radiological data and renal tissue specimens were reviewed. The 26 cases were grouped into those not abusing themselves with analgesics (Group I) and those abusing themselves with analgesics (Group II). The review was conducted under the term "papillary necrosis," because this condition may be diagnosed clinically by its typical symptoms of colic, oliguria, hematuria and passage of papillary findings in the urine and by radiological findings. Renal papillary necrosis is also an undisputed morphological finding.

FINDINGS

Group I

Eleven patients gave no history of analgesic abuse. Clinical course and morphological findings in this group were distinct from the findings in analgesic abuse. These patients were usually elderly people with debilitating disease, diabetes and/or urinary obstruction. The diagnosis of papillary necrosis was usually made as a coincidental finding at autopsy; death was not due to renal failure. The kidneys were of normal size and showed acute pyelonephritis.

Group II

In the group of 15 patients admitting a significant abuse of analgesic mixtures (expressed as >1 kg. phenacetin) neurotic complaints were common, but 7 patients had chronic disease of the nervous or of the skeletal system. The typical clinical course lasted several years, and was associated with renal colic, papilluria, gradually increasing renal insufficiency and death in uremia. Five patients had also taken prolonged corticosteroid medication. Tissue specimens showed contracted kidneys, a conspicuous absence of acute inflammatory reactions and severe sclerosis ("mummification") of the renal medulla.

The duration of analgesic abuse was from 2 to 30 years with 1 to 40 tablets taken per day. Seven patients had also taken excessive amounts of other drugs (narcotics, barbiturates, bromides and salicylates). Seven of the 15 patients stated that a chronic disease of the nervous or skeletal system was the reason for taking analgesics excessively.

CONCLUSIONS

It was concluded that analgesic nephropathy is a true entity, is common in Ottawa, and its clinical and morphological features can be distinguished from other diseases that are associated with papillary necrosis.

A rising incidence of analgesic nephropathy, another disease in the long list of drug-induced illnesses, is now apparent in Canada. It can be prevented if patients can be warned of the dangers. The authors disagreed with those who question the usefulness of the warning notice on analgesic bottles.

Sturner, William Q.; and Garriott, James C. Deaths involving propoxyphene: A study of 41 cases over a two-year period. Journal of the American Medical Association, 223(10):1125-1130, March 5, 1973.

DRUG	Analgesic - Propoxyphene (Darvon)
SAMPLE SIZE	41
SAMPLE TYPE	Treatment (inpatient)
AGE	1 Infant; 4 Adolescents; 32 Adults; 4 Aged
SEX	14 Male, 27 Female
ETHNICITY	10 Black, 31 White
GEOGRAPHICAL AREA	Dallas County, Texas
METHODOLOGY	Case Study
DATA COLLECTION INSTRUMENT	Program/Clinic Statistics
DATE(S) CONDUCTED	1970 and 1971
NO. OF REFERENCES	16

SUMMARY

The study investigated 41 cases of deaths involving the use of propoxyphene (Darvon) in Dallas County, Texas, during 1970 and 1971. This time period was chosen for study because complete records and adequate analytical techniques became available in 1970. Propoxyphene was detectable in either the blood, urine or tissues (stomach, liver, kidneys, lungs) of each of the 41 decedents.

It was concluded that the availability of propoxyphene makes it a convenient drug for suicide attempts.

METHODOLOGY

The patients' history, drug dosage, place of death, post-mortem findings, cause and manner of death, and blood alcohol level were assessed. The 41 subjects, 27 female and 14 male, ranged in age from 2-70 years old. There were 10 Negro and 31 White patients. A gas chromatography method was used to detect drug concentrations. The minimum lethal dose of propoxyphene for humans was reported to be from 500 to 800 mg., which would result in a blood concentration of 0.046 to 0.074 mg/100 ml.

FINDINGS

Blood concentrations in patients ranged from 0.05 to 1.10 mg/100 ml, with the majority between 0.20 and 0.90 mg/100 ml. The data indicated that 1.00 mg/100 ml may be the upper limit of the blood saturation level, since the liver, lungs and kidneys accumulated 10 to 20 or more times the blood drug level. In cases of intravenous injection, levels were much higher in the lungs than in the liver.

During the two-year period, ten deaths were attributed to propoxyphene alone, 12 deaths from the drug in combination with alcohol, 19 cases where the drug level was high but was not the cause of death, and 11 cases of death from other causes with propoxyphene detected in therapeutic levels. Seventeen of all these deaths were classified as suicides, 8 as natural, 5 as accidents, 1 as homicide, 8 as undetermined, and 1 as unclassified (propoxyphene and dimenhydrinate poisoning).

CONCLUSIONS

During the same period there were twice as many deaths from barbiturates alone as there were from propoxyphene alone, but there was an equal number of deaths from each of these drugs in combination with alcohol. Although recovery from barbiturates was reported to be four times greater than in propoxyphene intoxication, the relatively small number of requests for propoxyphene analysis could have distorted this figure.

The author noted that the availability of propoxyphene makes it a convenient choice for suicide attempts.

Baden, Michael M. Methadone related deaths in New York City. The International Journal of the Addictions, 5(6):489-498, September 1971.

DRUG	Methadone
SAMPLE SIZE	32
SAMPLE TYPE	Methadone-Related Deaths
AGE	Not Specified
SEX	Not Specified
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	New York City, New York
METHODOLOGY	Case Studies
DATA COLLECTION INSTRUMENT	Medical Examiner Records
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	0

SUMMARY

This preliminary report, an investigation into methadone related deaths on the basis of existing data, evaluated methadone maintenance as an approach in meeting the heroin addiction problem in New York City, which had reached epidemic proportions.

METHODOLOGY

The report was based on data from 32 methadone related deaths investigated by the Office of the Chief Medical Examiner in New York

City over a 3-year period. Included were 24 deaths of persons who were in methadone maintenance treatment programs and who died of various natural and unnatural causes, and 8 deaths of persons not in maintenance programs, who died as a result of illicit methadone abuse.

FINDINGS

Twelve, or one-half, of the deaths of persons who were on methadone maintenance were a result of abuse of alcohol, barbiturates, or amphetamines. Six persons died because of increased consumption of alcohol, having ingested large amounts just prior to death, with evidence at autopsy of liver disease due to alcoholism. Six of the maintenance patients died because of overdose of barbiturates or amphetamines; some were overt suicides, others may have been inadvertent in the course of barbiturate and amphetamine abuse. One of the 24 deaths was due to an acute reaction to the intravenous injection of heroin (so-called overdose). There were 4 traumatic deaths in the maintenance group, 2 as the result of homicide. Another person was found unconcscious in the street with a fracture of the skull and brain injuries; the attendant circumstances were still under investigation at the time of this report. One 38-year old male struck by a car died a few hours post-operatively with nc anatomic reasons for death demonstrated at autopsy. Two deaths could be considered complications of heroin addiction; one was the result of hepatitis and the other the result of post-necrotic cirrhosis of the liver that could have been a sequela of hepatitis. Four persons died of natural causes: 2 of occlusive coronary arteriosclerosis and 2 of intracerebral hemorrhage. Six additional deaths of persons in methadone maintenance programs that were not initially reported were still under investigation at the time of this report.

In the group of 8 persons who died as a result of methadone abuse, none were in maintenance programs. In 2 instances heroin addicts died who apparently had injected methadone, thought to be heroin, intravenously. One addict, a 36-year old male addicted to methadone for 10 years, died of an acute reaction following an intravenous injection of methadone during the period of this study. Five deaths, some intentional and others inadvertent, resulted from oral ingestion of methadone in orange juice. Two persons were discovered while still alive. Both were admitted to hospitals comatose; both responded initially to nalorphine, an effective antidote for heroin overdose, and both became alert, then lapsed into coma and died in a few hours.

CONCLUSIONS

The report points out that the Medical Examiner's Office sees only failures; these deaths must be interpreted together with many other factors for proper program evaluation. However, these cases do indicate that methadone use must be carefully supervised, that the potential for methadone abuse does exist, and that methadone must be kept away from non-tolerant individuals. Methadone maintenance

together with ancillary services, is helpful for a selected group of heroin addicts who are not alcoholics, not schizophrenics, not multiple drug users, and 21 years of age or older. Some of the deaths may have occurred because alcoholics and other drug users eluded the screening procedure. The excluded groups, however, may comprise a sizeable majority of the heroin addict population. To assume methadone maintenance is a simple solution to a complex medical-psychiatric-legal-social problem is to invite political extension of methadone dispensation, with a concomitant inevitable increase in failures which may bring unwarranted discredit to the entire program.

Roizin, L., et al. Methadone fatalities in heroin addicts. Psychiatric Quarterly, 46(3):393-410, 1972.

DRUG	Heroin; Methadone
SAMPLE SIZE	12
SAMPLE TYPE	Methadone Fatalities Treatment (outpatient)
AGE	18-65
SEX	Both Male and Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	Not Specified
METHODOLOGY	Case Studies
DATA COLLECTION INSTRUMENT	Laboratory/Examination
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	37

SUMMARY

This paper investigated adverse and toxicologic reactions and fatalities caused by methadone, in order to explore some of the underlying pathogenic mechanisms. It is based upon a review of the pertinent literature; the study of 12 human fatalities that had been attributed to abuse or overdosage of methadone in heroin addicts; and acute experimental investigations in rodents.

METHODOLOGY

Published data and findings of various investigators are summarized in tables and analyzed. Clinico-pathologic observations with regard

to the 12 selected methadone fatalities are presented in a table and discussed. Postmortem tissues and body fluids of the 12 fatalities were examined by way of a multidisciplinary methodology, including toxicologic analyses of urine, blood, and gastric content, and 33 samples of body tissues, which are correlated with histopathologic (principally neuropathologic) examinations, as well as histochemical (enzymes) and electron-microscope examinations, as outlined in another table.

FINDINGS

The fatality rate among heroin addicts (between the ages of 15 and 35) undergoing methadone-maintenance treatment ranges between 1 and 1.3 percent. This percentage appears to rise to 10 percent among drug abuse patients who have been discharged or who have voluntarily discontinued the detoxification or withdrawal treatment.

Alcohol, multiple drug intake, medical and behavioral or psychiatric co-factors represent the most common potentiating and aggravating elements. The most common causes of death are: respiratory depression or failure; pulmonary edema and complications; liver damage (hepatitis and postnecrotic cirrhosis); secondary infections; trauma (violent deaths, accidents); and, in some instances, the emergence of anaphylactic or allergic mechanisms.

Histochemical and electron-microscope investigations reveal that the drugs are bound into the tissues in a diversified distribution and concentration and that adverse and toxic drug reactions are associated with: (a) changes of the hydrolytic enzyme systems; (b) fine ultrastructural alterations of the ultracellular organelles; (c) changes in the communication or transport mechanisms in the CNS (particularly the synaptic complex and axonal flow); and (d) changes in membrane permeability (including the brain-blood barrier). Comparative studies of human and experimental toxicology suggest that the tissue reaction patterns are the results of the interplay between the overall histological co-factors of the reacting organism (inherited and acquired) and the pharmacodynamic properties of the chemical agents, together with the participation of certain accessory or secondary co-factors (environmental, nutritional, stressor and socioecological).

CONCLUSIONS

Drug patients should not be simply abandoned when they fail to follow the provisional methadone programs. They should be advised about: (a) the potential toxicity of methadone; (b) the harmful consequences that may result from the potentiating effects of opiates and non-opiate narcotics, and (c) the dangerous interactions between methadone and barbiturates, tranquilizers, amphetamines--and especially alcohol intake.

The significance of the cumulative effects of co-participating biological factors with drug pharmacodynamics--discussed in the pathogenesis of adverse reactions, as being among the most common causes of fatalities in heroin addicts who are being treated with methadone--constitutes the basis for issuing a strong warning against the indiscriminate use of methadone by non-medical and improperly trained professional personnel.

Smart, Reginald G.; and Bateman, Karen. Unfavourable reactions to LSD: A review and analysis of the available case reports. Canadian Medical Association Journal, 97:1214-1221, November 11, 1967.

DRUG	LSD
SAMPLE SIZE	225
SAMPLE TYPE	LSD Users
AGE	Not Specified
SEX	Both Male and Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	More Than Two Cities
METHODOLOGY	Case Studies
DATA COLLECTION INSTRUMENT	Clinical Literature Search
DATE(S) CONDUCTED	June 1967
NO. OF REFERENCES	37

SUMMARY

The intent of this paper was to review all of the reported unfavorable reactions to LSD and to establish their frequency and origin in the personality of the user or in the features of his LSD experience. An effort was also made to describe the persons who use LSD for "kicks" or psychedelic purposes. Because many of the reported drug complications appear in these people, their backgrounds are of special interest. The most serious complications include prolonged psychotic reactions, recurrent LSD experiences, disturbed nonpsychotic reactions, and, less frequently, suicide,

homicide and convulsions. It has also been suggested that the acute toxic effects of LSD could lead to death. People have speculated that LSD users could develop addiction or physical dependence and that they could be led to try drugs such as heroin or morphine. Analysis of these complications for the necessary and sufficient conditions on which they depend seemed indicated.

METHODOLOGY

All of the usual abstracting services in addition to the Addiction Research Foundation Archive of Drug Literature were searched for reported cases. There were 21 reports which contained the details of 225 adverse reactions to LSD by June of 1967. There were 142 cases of prolonged psychotic reactions, 63 non-psychotic reactions, 11 spontaneous recurrences, 19 attempted suicides, 4 attempted homicides, 11 successful suicides and 1 successful homicide. An additional 9 cases showed possible suicidal intent. No clear cases were reported in the clinical literature of dependency, addiction or death due to toxic effects. There were 6 cases of convulsions which might be seen as toxic reactions. The main features of these adverse reactions and the social characteristics of those affected were investigated.

FINDINGS

The review provided a number of clues to predisposing factors for unfavorable reactions to LSD. It is uncertain what proportion of the total LSD sessions results in adverse reactions. Reports of adverse reactions, however, give some indication about the persons who are likely to volunteer to take LSD, and they helped to indicate the nature and distribution of hallucinogenic usage. Most of the reactions in every category described occurred most frequently in persons taking LSD in unprotected settings alone, with friends, or with others who were taking LSD. However, almost two-thirds of the suicidal attempts and the only successful homicide occurred in carefully protected settings; there have not been enough follow-up studies to be certain that LSD therapy is safe, particularly with regard to suicidal thoughts and behavior.

Although many of those with prolonged psychotic reactions had previous personality disturbances, the proportion may be as low as 23%, as one study indicated. Spontaneous recurrences and psychopathic reactions appeared almost exclusively in very heavy users, but many of the other reactions appeared after a single, relatively moderate dose. Judging from the reactions reported so far, a safe dosage, a safe series of doses, or a personality which is certain to create no unfavorable reaction to LSD cannot be guaranteed. Many cases have been reported in which a single,

moderate dose of LSD led to a profoundly adverse reaction in otherwise normal persons, especially where the dose had been taken in an unprotected situation.

The analysis of adverse reactions also contributes to knowledge of the manner in which LSD users differ from the general population. The users would appear to be mainly young male college students or former students, some of whom have had previous personality problems of a psychotic or neurotic type. These special characteristics make it likely that illicit use of LSD is an urban phenomenon.

CONCLUSIONS

Much research on the adverse effects of LSD remains to be done. More studies of the long-term effects of LSD are needed -- studies of both the effects of long LSD use and of the development and progress of unfavorable reactions. Data on the frequency of illicit use are unavailable, so prevalence rates of adverse reactions for this type of use cannot be estimated. It is also important to understand something of the attraction of LSD for the male population in college. Currently little is known of the reinforcements for taking LSD nor of the personality and social needs which are served by the hallucinogens in general.. Many of the adverse reactions to LSD will remain enigmas until some of these basic psychological investigations are made.

Robinson, Ann E. Recovery of cannabis constituents from the hands at autopsy. Bulletin on Narcotics, 23(3): 37-40, July-September, 1971. (2 references).

SUMMARY

This article describes a successful demonstration of cannabis constituents (or smoke condensates) on the hands of deceased persons including cases where the body was found in water. Four autopsy case studies are included as well as a description of the analytical procedure used. It was suggested that this technique was appropriate for epidemiological surveys or studies of cannabis use when identification of users on an objective rather than subjective basis is desired and a more accurate assessment of incidence is necessary.

The technique described was based on chromatographic methods established in the Department of Forensic Medicine, London Hospital Medical College in connection with recognition and identification of cannabis, cannabis resin and prescribable preparations. Details of the technique used were described in the article.

Although such results would probably not be judged acceptable in a court of law in a charge of unlawful possession, this technique was assessed as useful for an epidemiological study or other such objective studies.

Wyse, D. George. Deliberate inhalation of volatile hydrocarbons: A review. Canadian Medical Association Journal, 108:71-74, January 6, 1973.

DRUG	Inhalants
SAMPLE SIZE	Not Specified
SAMPLE TYPE	Not Specified
AGE	Adolescents
SEX	Both Male and Female
ETHNICITY	Not Specified
GEOGRAPHICAL AREA	Not Specified
METHODOLOGY	Exploratory/Descriptive
DATA COLLECTION INSTRUMENT	Literature Search--Studies
DATE(S) CONDUCTED	Not Specified
NO. OF REFERENCES	34

SUMMARY

The author conducted a literature search on the deliberate inhalation of volatile hydrocarbons and presents a review of his findings. The deliberate inhalation of volatile hydrocarbons (commonly known as "glue-sniffing") is one of the forms of intoxication which is in current practice among many north American adolescents. The number of substances used varies considerably, but all are comprised of a large percentage of solvents with volatile hydrocarbon bases or halogenated

aerosol propellants. These hydrocarbons act as depressants to the central nervous system even if at first they occasionally exert a stimulant effect.

The inhalation of hydrocarbons produces a certain degree of inebriation characterized by euphoria, confusion, disorientation, muscular uncoordination, sneezing and coughing, drowsiness, and sometimes hallucinations. Among the most serious consequences are fatal toxic reactions, psychological dependence, plastic bag suffocation, and serious injuries which the subject self-inflicts during the period of "high." The treatment of intoxication is symptomatic but the chronic user should be referred for a psychiatric examination and be investigated for organic physical damage as well.

Literature Review

The review of the literature showed that the practice of hydrocarbon inhalation began to increase in North America around 1960. A questionnaire answered by college students showed that 14.2% of the students had inhaled volatile hydrocarbons on at least one occasion. Socially and economically disadvantaged sections of major cities had a much higher rate of use among teenage boys.

Two kinds of users have emerged: the chronic abuser who sniffs regularly, and the "social" user who sniffs only occasionally. The mean age of sniffers was found to be 14 and 15 years, although reports existed of regular users as young as 7 or 8 years. There were few reports of adults sniffing on a regular basis. On the average, boys outnumbered girls about 10 to 1. It was generally agreed that chronic inhalation of volatile hydrocarbons is a problem of the poor and socially deprived child.

Because hydrocarbons are the active drugs in the substance used, the practice studied is correctly referred to as "hydrocarbon inhalation" rather than "glue sniffing." Some of the agents abused in the practice of inhalation were: plastic cement, model cement and airplane glue, household cement, fingernail polish remover, lacquer thinner or paint thinner and various lacquers and paints, lighter fluid, cleaning fluid, gasoline, antifreeze, marking pencils, rubber cement, products packaged in aerosol cans, and pure solvents. Inhaled vapors of these drugs pass rapidly from the alveoli into the blood and from the blood into the brain. The initial effects are experienced within seconds.

The initial discovery of volatile hydrocarbon inhalation might be accidental but more commonly a sniffer was introduced to the practice by friends.

The pharmacology of most of the drugs enumerated was unknown. Generally hydrocarbons are central nervous system depressants with an initial excitatory effect. Symptoms of the inhalation usually developed in a progressive sequence from euphoria to drowsiness and a dream-like state in later stages. Visual and/or auditory hallucinations occurred in as many as 50% of cases studied. A few deep breaths produced an effect which dissipated over 30 to 45 minutes. Hydrocarbon inhalation did not usually result in severe central nervous system depression and unconsciousness.

The author enumerated a few rare but severe toxic effects of inhalation of volatile hydrocarbons. During the 1960's at least 110 sudden deaths not explainable by plastic bag suffocation occurred during sniffing episodes in the United States. Sudden deaths occurred more frequently when the substance sniffed contained trichloroethane or the halogenated aerosol propellants. Large doses of the halogenated hydrocarbons when combined with moderate exertion, excitement and hypercapnia, can cause severe cardiac arrhythmias, ventricular fibrillation and death. One of the most frequently used hydrocarbons, toluene, has been implicated as a causative agent in cardiac arrhythmias. Other serious toxic effects usually developed only after repeated exposure to some of the substances. Sniffing apparently did lead to elevated cerebro-spinal fluid pressure and cerebral edema was found at autopsy after death attributed to deliberate sniffing. Hematological findings and reports of kidney or liver damage were also examined.

CONCLUSIONS

The author concluded that there is no question a strong psychological dependence develops in some sniffers. The chronic sniffer develops tolerance which can be quite marked in individual cases. There is no specific medical treatment for acute intoxication due to hydrocarbon inhalation. Exposure to fresh air or administration of oxygen is usually sufficient to alleviate acute intoxication. The author warned against the use of sympathomimetic amines such as adrenalin. In the hospital, anti-arrhythmic drugs, defibrillation or pacing may return cardiac rhythm to normal. It was suggested that patients who have a history of chronic habituation to glue sniffing should be hospitalized and tested for damage to the brain, liver, kidneys, and bone

marrow. In the case of a chronic user, psychiatric treatment should be instituted to remedy the underlying psychological problem which has led to the use of these agents.

Whelton, Andrew; Snyder, O. Stephen; and Walker, W. Gordon. Acute toxic drug ingestions at the Johns Hopkins Hospital 1963 through 1970. Johns Hopkins Medical Journal, 132(3):157-167, March, 1973.

DRUG	Multi-Drug
SAMPLE SIZE	519
SAMPLE TYPE	Treatment (inpatient)
AGE	Cross-Age
SEX	Both Male and Female
ETHNICITY	Cross-Cultural
GEOGRAPHICAL AREA	Baltimore area, Maryland
METHODOLOGY	Statistical Survey; Case Studies
DATA COLLECTION INSTRUMENT	Laboratory/Examination; Program/Clinic Statistics
DATE(S) CONDUCTED	1971
NO. OF REFERENCES	11

SUMMARY

The spectrum of acute toxic ingestions managed at Johns Hopkins Hospital from 1963 to 1970 was reviewed and analyzed. Case histories are reported for each death. The mortality rate during the review period was 1.9% with heroin the most lethal and numerically important cause of drug overdosage, particularly among males in their teens and twenties.

METHODOLOGY

Admission data pertinent to accidental and self-induced drug poisoning were obtained for the period January 1963 through December 1970; preliminary admission data for the first several months of 1971 were also obtained.

During this eight-year period, 519 patients were admitted to Johns Hopkins Hospital for drug poisoning. This number represented 0.54% of all medical and pediatric admissions for the period 1963-1967, and 0.9% of all admissions for the years 1968-1970. Preliminary 1971 figures indicated an admission rate greater than 1%. (A total of 5000 hospital visits was estimated for the years 1963 to 1970 when cases handled in the Emergency Department were included.) This study reported only those in-patients suffering acute poisoning from substances taken accidentally or in suicide attempts. Adverse reactions to digitalis, penicillin and alcohol were not included in this report.

FINDINGS

Barbiturates were responsible for the greatest number of hospitalizations, while heroin was responsible for the majority of drug-induced deaths. Four patients died from heroin overdoses; there were three deaths from barbiturates, one from glutethimide (a tranquilizer), and one from salicylate. Almost 70% of the admissions occurred in five categories of intoxicants, as follows: barbiturates, 175 patients; salicylate, 54; iron, 36; glutethimide, 30; and heroin, 65. One additional death resulted from the ingestion of roach powder.

Heroin admissions increased from 3 (1963-1967) to 62 patients (1968-1970). The 4 heroin deaths also occurred in the latter period. The heroin patients were mostly males in their teens and twenties. Based on the Baden and DuPont formulas and statistics from the Maryland State Examiner's office, it was estimated that there were from 20,000 to 40,000 heroin addicts in the Baltimore area in 1971.

Barbiturate patients were preponderantly female and the mortality rate was 1.7%. Late referral of barbiturate intoxications most often resulted in death. Hemodialysis was used in the most severe cases; all the hemodialyzed patients survived (except for one who died of unrelated complications).

Salicylates (and iron) were most often found as intoxicants in pediatric patients, with a uniform recovery rate. The adult death in salicylate poisoning was a result of treatment complications which led to pulmonary edema and cardiac arrest. The glutethimide patient died from complications resulting in a pulmonary embolus and cardiac arrest.

CONCLUSIONS

It is estimated that with proper intensive care, the "inevitable" death rate of drug ingestion patients can be reduced to less than 2% (of hospitalized drug patients). All heroin patients are now admitted immediately to in-patient services from the Emergency Department due to their frequent manifestations of delayed cardiopulmonary complications.

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The keyword terms selected for the indexes are those terms used in the literature; no terms were inferred. The most specific term was used whenever possible. Thus, some material on marijuana will be found under that term but other material may be found under the term cannabis. Similarly, studies of heroin use may be indexed under heroin but also under opiates.

For convenience to the reader, the indexes have been divided into the following five sections:

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Includes general and specific names of all drugs mentioned in the abstract, as used by the authors of the document.

Sample Types

Terms which describe as specifically as possible the sample population studied.

Geographic Locations

Organized by state, the location where the study was carried out; includes also names of universities, schools, drug programs, committees, etc., in the order in which they occur in the abstracts.

Subjects

Terms which describe the subjects or concepts of the studies; included also are names of specific data collection instruments, evaluation tools, and questionnaires.

Authors

All authors named in the citation to each abstract are listed in the author index; however, this does not include all authors of the materials abstracted since documents with more than two authors have been cited with et al.

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